COAL AGE

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DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

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New York, November, 1933

Inter-union Warfare

STRONG WORDS are used by Donald Richberg, general counsel of NRA, in his report on the Illinois mine-labor war, but the language is no stronger than the situation in that state warrants. An organization campaign which can succeed only through the repudiation of contracts made in good faith between employers and another union cannot appeal to disinterested observers. When, as in Illinois and, to a lesser degree, in the hard-coal area of Pennsylvania, that campaign is carried on by intimidation, forced suspensions of operations, illegal strikes and physical violence, condemnation of such tactics must be voiced in still more vigorous terms. Mr. Richberg puts the case succinctly when he declares that it is intolerable "that any group of men with guns in their hands should be permitted to threaten that the government must either support their demands or that they will resort to murder to gain their ends."

Up to Uncle Sam

UNTIL the federal government declared itself a partner with capital and labor in the bituminous coal-mining industry, that industry was in a position to wield the weapon of lower prices in combating the inroads of oil and natural gas. In union fields, profits were sacrificed in the struggle; in the non-union fields, both earnings and wages were slashed. Today, with wages definitely pegged and minimum price levels established by code authorities, the coal industry's freedom of action in meeting inter-fuel competition is gone. The responsibility of maintaining a fair competitive relationship between these contestants for the national energy market now rests upon the federal government, and the need for early action is imperative. Unless this responsibility is promptly discharged, new-born hopes for profit in bituminous mining will vanish and opportunities for employment in that industry will be sharply curtailed.

Railroad Fuel Subsidies

WITH THE PRINCIPLE that railroads should not buy traffic by paying more than a fair market price for coal or any other commodity which they use there can be no disagreement. The alternative suggestion, made by Federal Railroad Coordinator Eastman in releasing the report and recommendations of W. P. Bartel, director of service, Interstate Commerce Commission, on fuel purchasing, that a reduction in the freight rates on coal would be a much sounder and more effective way to help the mines meet the competition of other fuels merits whole-hearted approval. Speed the day when the reluctant railroad members of Mr. Eastman's flock give heed to his counsel!

Any implication that subsidization through high prices has been a common practice, however, should not go unchallenged. While some carriers may have been unduly liberal in fixing fuel prices, there have been others that have taken full advantage of the disorganization of the mining industry and have contributed to its further demoralization by encouraging insane

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competitive bidding. Railroad fuel bought at 60 to 80 cents per ton was hardly a largess to make any operator rich or even permit the payment of decent living wages to the mine worker.

Such philanthropic consideration for the pocketbooks of the carriers who have been steadily reducing their fuel bills through lower mine prices and increased combustion efficiency suggests that the subsidies have not been all one-sided. In fact, even today under the NRA code which is set up to eliminate uneconomic and prejudicial merchandising practices, several subdivisional code authorities propose railroad fuel prices approximately ten cents per ton under the minima fixed for other classes of consumers. Just why the railroads should be so favored is not explained.

Is Coal a Plant Stimulant?

SO MANY and varied have been the opinions advanced as to the value of coal as a plant stimulant that the layman and the scientist apparently are at a loss to reach a conclusion. Prof. W. R. Chedsey's article in the September issue of *Coal Age* (p. 303), based on analyses and field experiments, had an equal finality with other statements also based on experiment and uttered with equal assurance. True, the professor is willing to concede that perhaps coals of lesser maturity may have other characteristics.

As an example of opinions favoring coal as an aid to plant development, Professor Lieske, of the Kaiser Wilhelm Institut für Kohlenforschung, may be quoted. Having noted that near German brown-coal deposits, vegetation flourished, he concluded that the dust from these coal beds must have some relation to the unusual fertility. So he experimented and found that the Alpine violet, which responds so meagerly to fertilizers, presented larger blossoms and developed healthier dark green leaves when the soil was fed with a little brown coal. Orchids also responded to the same treatment.

Humic acids, which are found in coal and vegetation, when mixed with metallic compounds, stimulated the growth of mushrooms, whereas the compounds alone were not so helpful. Extracts of the redwood, a tree similar to those which grew when the peat was laid down from which the brown coal was derived, strangely, failed to stimulate his plants. So he concluded that time wrought a change in the wood which made it not less but more active in promoting the growth of vegetation. In this conclusion he takes an opposite view to agriculturists, who say that fresh vegetation with its vitamins, proteins, fats and enzymes laid in or on the ground or dripping rain water onto it is more likely to promote fertility than the dead lignin, the wooden box in which the true life of the plant is buried.

Now we are told by Drs. Ascheim and Hollweg that perhaps auxins, the group of substances of which the sex hormones of mammals are a specific instance, may be found in that brown coal as a result of its millions of years of change and decay. They give evidence to suggest it. Question arises, therefore, whether such auxins can continue to live through or even be augmented in later stages, making step by step the ascent from brown coal to lignite, from lignite to sub-bituminous, and from sub-bituminous to bituminous coal, and even further. Can they face the heat and metabolism that drive out methane, carbon dioxide and water without being themselves metabolized?

For such problems there remains but one answer: careful experiment.

Not Just Lucky

DURING the first six months of this year, there were 96 men killed in the anthracite mines of Pennsylvania. But, during that same period, 214 out of 269 operations covered by reports of the State Department of Mines worked without a single fatal accident and produced approximately 50 per cent of the total hard-coal output for the half year. Here, in the words of Harrisburg, is a record "without parallel in the history of anthracite mining."

Spectacular achievements in safety at a few mines are too frequently glossed over by apologists for the high accident rate of the industry as the result of unusually favorable conditions, plus a large share of luck. In the face of this anthracite showing, however, embracing every type of operation from the small mine, washery and strip pit to some of the largest collieries in the region, this easy excuse for failure to measure up rings hollow. Where so many operations are involved, luck must yield to an unremitting determination to achieve as the major factor in this record.

POWER-FACTOR WORK

+ Results in Material Savings

At Madeira, Hill & Co. Collieries

WHERE conditions permit it, power-factor improvement may result in a heavy saving with a comparatively slight investment in equipment. At the anthracite operations of Madeira, Hill & Co., for instance, revision of transformer connections, changes in drives to cut down over-motoring, installation of synchronous motors where feasible, and an investment of approximately $12,000 in corrective equipment is expected to yield a saving of $1,005 to $1,150 per month, largely in demand charges, as a result of the completion of the program in October. In addition to the direct savings growing out of power-factor improvement, other less tangible but nevertheless important savings are expected through better voltage conditions and consequent higher operating efficiency.

The Madeira, Hill & Co. operations included in the improvement program are the Lawrence, Morea and Colonial collieries. At the Kehley's Run colliery, the short remaining working life made installation of corrective equipment inadvisable. These operations were electrified ten to fifteen years ago—among the first in the region—which, in connection with the fact that penalties for low power factor were not assesed by the utility companies at that time, accounts for the original failure to employ practices and equipment designed to improve power factor. In addition to the hereditary aspects, the reduced operating time growing out of the depression had a still further adverse effect on the power-factor situation and intensified the need for correction.

Power for all of the above collieries is purchased under a contract carrying a penalty in the form of an adjustment of the metered demand to an 85-per cent power-factor basis when the power factor is lower, and also a bonus corresponding to the penalty where the power factor is over 85 per cent. The Madeira, Hill & Co. program is directed toward the avoidance of a penalty and the earning of a bonus where possible.

As indicated above, the work at the operations of this company has taken several directions. The first step was a survey of conditions at each of the collieries by the engineering force under the direction of T. Eichler, mechanical engineer. This survey, undertaken jointly with the power company, included tests of the various circuits to show the conditions prevailing therein and also an examination into the possibilities of rearranging transformer and motor equipment and the installation of synchronous motors where possible.

Upon completion of the survey, the first step was the rearrangement of transformers to cut down transformer and reactance losses. At Morea colliery, which is served by three 1,500-kva., three-phase, 66,000/2,300-volt transformers, the necessary switches and air-break equipment was installed to permit one, two or three of the group to be used, according to load conditions. In general, the new arrangement provides for the use of one transformer during idle times, two on working days, and three during high-water periods or at other times of high demand. Ordinarily, two transformers are in service in winter and one in summer.

On Oct. 1, 1932, a 240-kva., 2,300-volt Westinghouse capacitor in a 300-kva. frame was installed in the 66,000/2,300-volt transformer station at Morea, and this installation, together with other changes, brought the power factor up to 88-92 per cent, against the 60-68 per cent registered prior to that time. Early in October of this year, however, the installation of a 700-hp. synchronous motor with an 0.8 leading power factor was begun to replace the capacitor. This motor drives a pump which is used both for supplying breaker water and dewatering the mine, the operating schedule calling for continuous service throughout the day while the breaker is running, and a

Savings Due to the Installation of Capacitors and the Power-Factor Improvement Program at Madeira, Hill & Co. Collieries

Colliery	Capacitors	Manufacturer	Location	Power-Factor Before, Per Cent	Power-Factor After, Per Cent	Cost of Capacitor	Monthly Saving
Morea	240 kva., 2,300 volts*	Westinghouse	Near 66,000/2,300-volt substation	60–68	88–92	$2,880	$180–$225
Lawrence (before and after transfer of Morea equipment):							
Before	360 kva., 2,300 volts	General Electric	Near 66,000/2,300-volt substation	50–55	70–75	4,095	250– 300
After	600 kva., 2,300 volts†	Both	Near 66,000/2,300-volt substation	70–75	83–87	6,975	500– 550
Colonial:							
Breaker Circuit	.....	.....	.....	70–73	85§	4,785	325– 375
Greenough	240 kva., 2,300 volts‡	General Electric	Near 11,000/2,300-volt substation				
No. 2 White Ash	240 kva., 2,300 volts‡	General Electric	Near 11,000/2,300-volt substation				

*Scheduled for transfer to Lawrence colliery after installation of 700-hp. synchronous motor with 0.8 leading power factor on pump.

†May be increased to 660 kva., if warranted in the future, by the addition of units in the frame of the present 240-kva. capacitor.

‡May be increased to 360 kva., if warranted in the future, by the addition of units in the frame.

§Approximate.

part of the night. During dry periods, the combined operating time is expected to be 15 to 18 hours; high-water periods, 20 to 24 hours. The capacitor displaced was scheduled to be added to the equipment at Lawrence colliery to further increase the power factor at that operation.

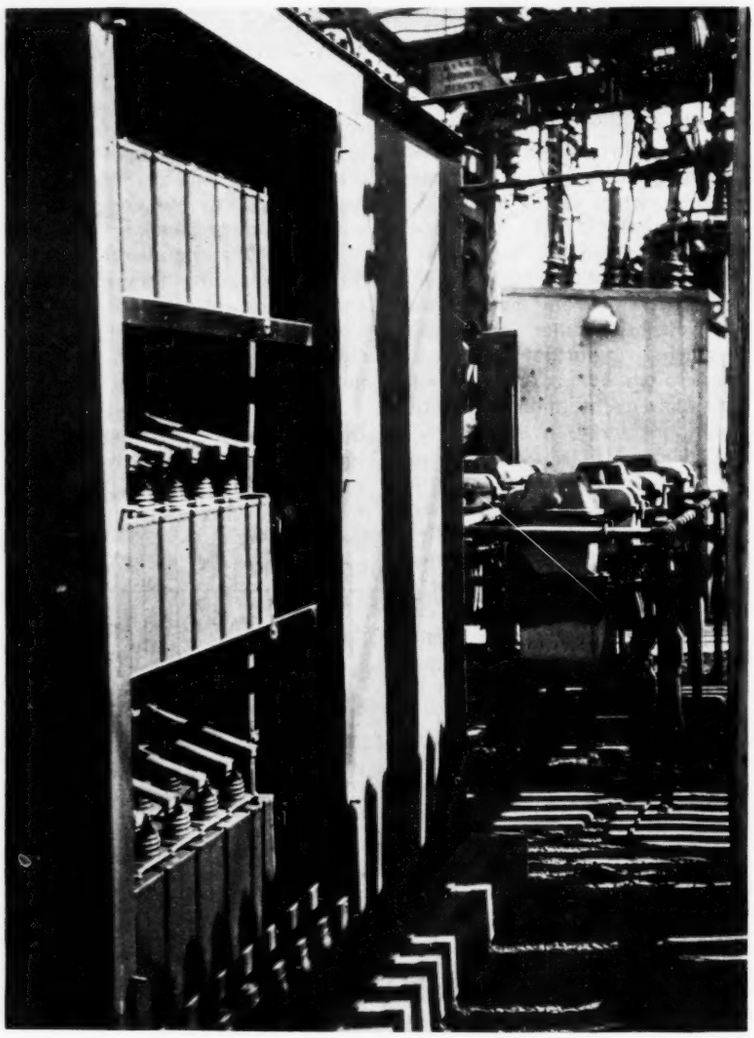
At the Lawrence colliery, which is served by three 2,000-kva., single-phase, 66,000/2,300-volt transformers, investigation showed that during low-water periods two transformers would supply the necessary power. In the absence of disconnects and oil switches, arrangements were made with the power company so that one transformer could be cut out at will, with the result that at night and during low-water idle periods only two transformers are in service. A 360-kva., 2,300-volt General Electric capacitor was installed on Oct. 4, 1932, bringing the power factor up to 70-75 per cent, as compared with the previous figure of 50-55 per cent. Transfer of the Morea equipment (240 kva.) and the addition of 60 kva. of capacity to bring the unit up to 300 kva. is expected to raise the power factor to a total of 83-87 per cent.

Colonial, the third operation in the program, is served by three 1,000-kva., single-phase, 66,000/2,300-volt and three 667-kva., single-phase, 66,000/11,000-volt transformers. The 2,300-volt equipment supplies the breaker and vicinity, and investigation showed that on this circuit, due to the presence of synchronous motors driving compressors, fans and pumps, the power factor was 80-85 per cent. In the case of the 11,000-volt equipment, which serves the Greenough and No. 2 White Ash openings, it was found that the power factor in these circuits was only approximately 50 per cent, making the plant power factor 70-73 per cent. Plans, therefore, were made for the installation of a 240-kva., 2,300-volt capacitor with a 360-kva. frame in each of these circuits at the substations. Installation was scheduled for October of this year, and the original capacity, together with additional capacity up to 120 kva. each, if necessary, will bring the power factor up to 85 per cent or more.

By increasing the load on an induction motor up to, or close to, full load, it is possible to show a material improvement in power factor over that prevailing when the motor is operating at, say, half or two-thirds load, due to the fact that the running current is increased while the magnetizing current remains practically constant. While the duty of motors at coal-mining plants is subject to marked variation, except in the case of fans, pumps and similar equipment operating under a stable load, there is still some opportunity left for bringing motor rating and duty closer together. Madeira, Hill & Co. motors are largely of the squirrel-cage type, though a few slip-ring motors are used, and operate on either 2,300 or 440 volts. Since the inception of the power-factor improvement program, the policy has been to shift motors about and revise drives to insure that each operates under the maximum load possible under the prevailing conditions. In addition, 440-volt motors are being replaced with 2,300-volt machines, as the opportunity offers, to reduce the current carried by the service lines.

Supplementing motor shifts and drive revisions, the company also has embarked on a program of replacing induction motors with synchronous motors for power-factor improvement. Naturally, the best condition for synchronous motor installation is a steady load, such as on fans and pumps. Therefore, when a squirrel-cage motor or, in some cases, a slip-ring motor on a fan or pump, reaches an age where the cost of repairs would equal the purchase price of new equipment, it is replaced by a synchronous motor.

Installation and operating results attained and expected at each of the three collieries (Morea, Lawrence and Colonial) are summarized in the accompanying table. In addition to the benefits shown in the table and discussed above, the company has found that improving the power factor has made it possible to remove from service one of a group of subsidiary transformers at a number of outlying points.



360-Kva., 2,300-Volt Capacitor at the Lawrence Transformer Station, With Side Plate Removed to Show Units in Racks.

FANS PUT UNDERGROUND

+ By Belgian Engineers

By F. C. CORNET
Mons, Belgium

USE of the fan shaft for hoisting at shaft mines has always been accompanied with much difficulty and disadvantage, because automatic air locks cannot be satisfactorily provided at the top of the shaft without undue wear on the hoisting ropes or an excessive leakage of air. In a short time, the doors are leaking badly, being strained and distorted by the repeated rough handling that accompanies each ascent and descent of the cage.

If cages are to make speedy trips, they must be permitted to retain much of their speed in that part of their travel where they come in contact with the lock gates. The resulting impact rapidly destroys the gates, and after a short time injures the cages also. Rope hitchings also suffer in a similar way. Lengths of a few feet have to be cut off the rope and the ends reclaimed much more often than is necessary where the shaft at all times is kept open at the top. Ropes, also, rub abnormally against the sides of the narrow holes in the lock gates through which they pass, with consequent wear, even though such holes are made of a diameter two or three inches larger than the rope diameter. If made larger, air leakage would increase, and with any arrangement too much air for economy will stream through the rope holes.

Ropes, while running, cannot be prevented from vibrating or even from flapping, and so are sure to rub now and then against the sides of the holes, wearing the strands and shortening rope life. In deep shafts, the tonnage any rope will hoist from the mine may be 30 to 40 per cent less than it might be expected to hoist if the shaft were open and the rope traveled without such interference. In Belgium, with shafts 2,000 or 3,000 ft. deep, the hoisting speed may be 65 or 70 ft. a second during 60 or 70 per cent of the run.

In shallow shafts, conditions for air-locking the shaft are more favorable than in deep shafts, for, as has been generally observed, the longer the rope in the shaft, the greater is its tendency to vibrate or flap. Moreover, with other conditions identical, a rope will vibrate or flap more when running fast than when running slow. A rope that rubs suffers, of course, from abrasion, but that is not all; its temperature is raised to a point where its tensile strength is greatly reduced. This explains why hoisting through air locks so greatly reduces the life and capacity of a rope.

In Belgium, because shafts are necessarily profoundly deep and the footage cost of sinking is uniformly high, additional shafts to those for intake and return air are never constructed. Unfortunately, the time consumed in hauling from profound depths and the delays incident to decaging and caging make the use of both shafts necessary. In the return-air shaft the coal passes through air locks, which consist of two double doors which the cage in passing opens one at a time. To free the shaft of these doors, they and the fan recently have been placed in some cases at the bottom of the shaft, where the former can be kept in good order and where they will not stress or wear the hoisting rope. Mine airways in Belgium, being in rock and under heavy cover, are of small cross-section, and also, being rough, water gages are high, but the volume of air is not large, partly because of the concentration of operations on a few longwall faces.

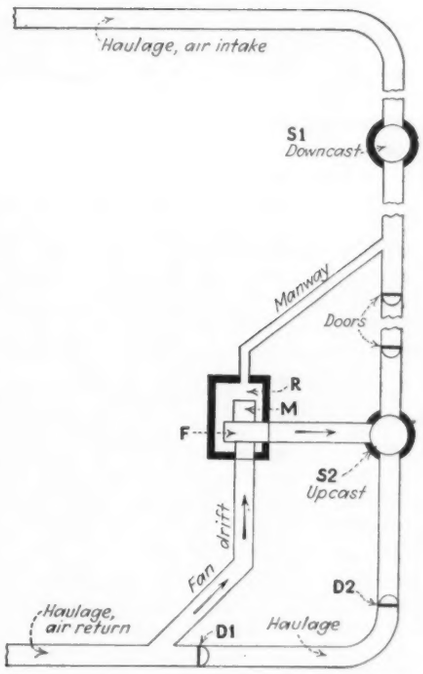


Fig. 1—Arrangement of Fan and Doors at Hautrage Mine.

At the Hautrage mine, near Mons, Belgium, M. Debilde, the superintendent, has taken the locks out of the fan shaft and shut down the surface fan. Fig. 1 shows part of the mine, 2,250 ft. below ground. A single-inlet suction fan, *F*, of ample capacity to ventilate the entire operation has been placed in a strong concrete room, *R*, the main dimensions of which are: length, 31 ft.; width, 18 ft.; and maximum height, 14 ft. This fan is driven by an electric motor, *M*, and delivers 82,000 cu.ft. of air per minute at a water gage of 6.69 in. With such a high water gage, the air lock is at considerable disadvantage in controlling the entry of air.

Air comes from the surface down shaft S_1 and, after circulating through the workings, is drawn through the fan drift into the inlet of the fan, *F*, which

forces the air into shaft S_2 through which it travels unobstructed to the surface. Trips travel through two automatic doors, D_1 and D_2, outbye the fan drift. These are interlocked, so that when one is opened, the other must remain closed, and they are placed so far apart that a full trip of cars with its locomotive can be run into the air lock, which is thus transferred from the shaft to the underground workings. The arrangement at the Hautrage mine has been so satisfactory that the company operating it made a similar change at its other operation, the Espérance.

Several of the moderately gassy mines of the Monceau-Fontaine Coal Co., in the Charleroi region, of which M. Canivet is general superintendent, have been converted in a similar manner, as also the Bois-du-Luc mines, in the Center district, and the Réunis mines, near Charleroi, but the Belgian Department of Mines, while permitting these installations, is still unwilling to grant mines subject to blowouts permission to do likewise.

Special efforts have been made to reduce the space occupied by fans, which now are made to run at speeds that, up to a year or two ago, would have seemed inadvisable to the conservative engineers of Belgium. Use is being made of silent-chain drives that permit the motor to be placed close to the fan casing.

A fan layout now greatly in favor is shown in Fig. 2, where a silent-chain-driven fan is shown set at an angle of 45 deg. to the direction of the main airway with the air turned by ducts which become circular in making the turn. This fan also has a single inlet. The principal dimensions of the fan room are shown, and they may be compared with those of the Hautrage fan chamber, already given. Both fans give approximately the same quantity of air, but the new fan runs at 500 r.p.m. and the Hautrage fan at 300. The fan shown in Fig. 2 gives 81,000 cu.ft. of air per minute and has a water gage of 7 in.

Opinions do not agree as to which is the better location for the fan relative to the air lock. Some would place it inbye, as in Fig. 4, and others outbye, as in Fig. 5, but the latter arrangement places it closer to the shaft lining, making it move quickly and easily accessible. Air lock doors are hung to open outbye —that is, toward the airshaft. Consequently, they oppose a minimum resistance to any rush of air and gas toward the shaft, and in case of an explosion might act as safety valves, thus protecting the fan from injury. To provide against the possibility of the inside fan being damaged, the surface fan is kept in good order at all times, so that, if necessary, it can be put promptly into operation after an explosion.

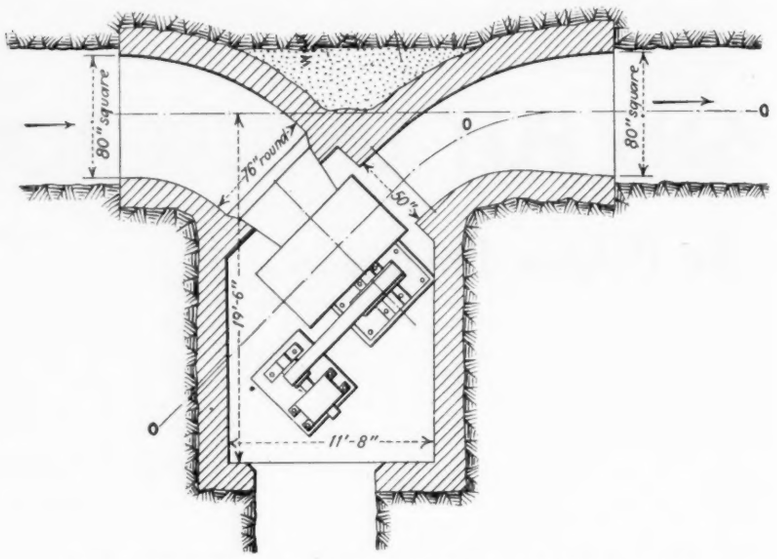


Fig. 2—Fan With Intake and Return Ducts at 45 Deg. to Airway.

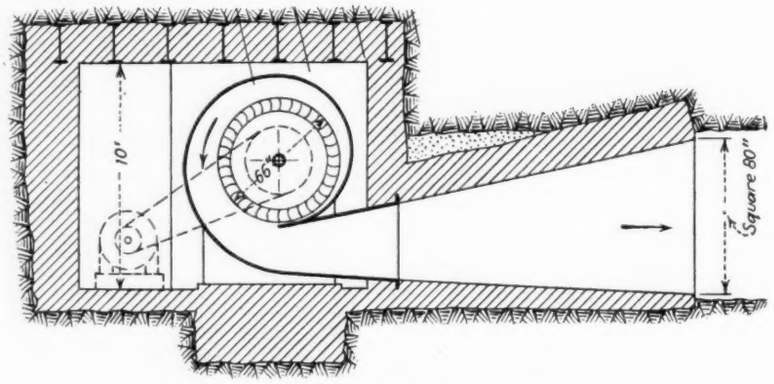


Fig. 3—Section 000 of Fan in Fig. 2

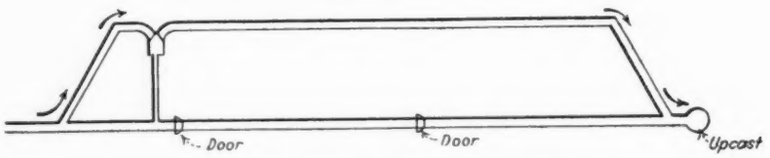


Fig. 4—Layout With Fan Inbye Doors.

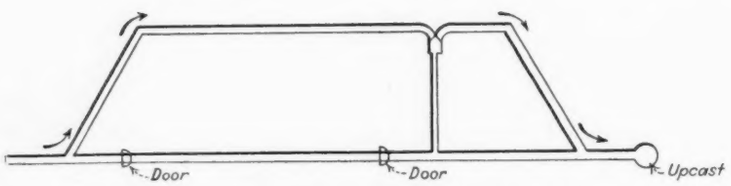


Fig. 5—Layout With Fan Outbye Doors.

RECORD PERFORMANCE

+ In Sheridan-Wyoming Mines

Seam at Sheridan-Wyoming Mines Being Drilled

AN OPERATION with an exemplary safety record and with advanced practice in mechanization and a low production cost, the plant of the Sheridan-Wyoming Coal Co., Inc., Kleenburn, Wyo., has received altogether too little attention. Because of its many years of experience with mechanical loading, there is a ring of finality in the record of these operations—that is, the work is no longer in any sense experimental, though the company is ready to make changes wherever the value of these is indicated.

Two mines are operated, the Monarch and Acme, both on Tongue River, a branch of the Yellowstone, which it joins at Miles City, Mont. These mines are located in Sheridan County, near the Montana line. Both mines operate the sub-bituminous coal of the Monarch seam, which has a thickness of 18 to 28 ft., of which thickness, however, only 10 to 11 ft. is mined.

In the Monarch mine, the seam is cut so as to leave 3 in. of coal in the floor of the mine, and at Acme, where the floor is unusually soft, a foot of coal is left. All the coal is cut by Goodman short-wall machines having 8½-ft. cutter bars equipped with Bowdil patent chains and bits. The area cut per 8-hour shift depends on opportunity rather than on the capacity of the machines, but 800 to 900 sq.ft. can be cut per machine-shift. The two men who operate each machine also drill and load the holes, a third man being employed on part time where the places are narrow and where, accordingly, more holes have to be drilled per linear foot of face. This man helps to drill holes and tamp shots.

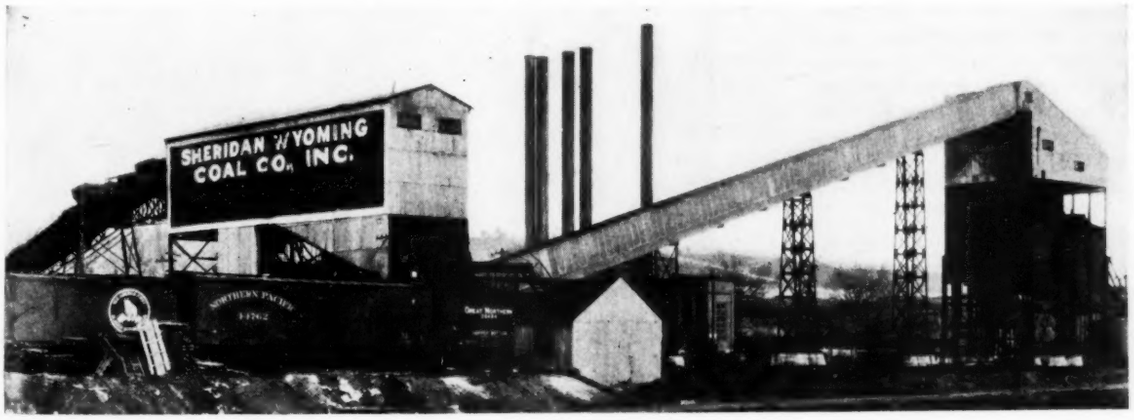
Three rooms, 28 ft. wide, are cut per 8-hour shift for the operation of the Goodman hydro-electric loading machines, and five development places, 14 to 28 ft. wide, for the Joy loaders. The cutting machines undercut the coal to a depth of 8 ft.

One place is shot at a time, using Sylvanite fuse, cut to appropriate lengths so as to time the shots correctly, and pellet black powder No. 2 in cartridges measuring 1¾x8 in., the usual charge per hole being 3 lb. As soon as a wide place has been undercut, four holes are drilled from 4½ to 5 ft. from the floor to break down the bottom of the face and four in the upper half of the coal. In headings which are only 14 ft. wide, only three holes are drilled in the bottom half and three in the top. Dooley Brothers Superior mounted drills are used for this purpose. Care is taken to clean the cuts well before shooting. Shots are fired by a shotfirer after all the men except the shotfirers have left the mine. By regulating the lengths of fuse, the two lower center shots explode first and break down the center coal, then the two lower rib shots, followed by the two center upper shots and later by the two upper rib shots.

A complete loading-machine crew comprises eight men, except that, at the Monarch mine, an additional man is used as a tamper with the cutting machine when preparing the face for the Joy loaders. These are one loader operator, one helper, one brusher or trimmer to square up face and top and to lay the track after the loading machines have cleaned up the faces, one motorman, one motor brakeman and tail-end rider, one car trimmer, one cutting-machine runner and his helper.

Rooms are of an average length of 350 ft. With Goodman loading machines, tracks are laid along each rib. For Joy loaders, a single track is used placed in the center line of the working place. While coal is being loaded which has been thrown on the track by the shots, cars have to be changed as fast as they are loaded, but after the track is

Acme Mine Tipple and Rescreening Plant



clean the Goodman loader backs out a short distance and loads the cars on one track and then on the other, and thus disposed the loader will fill two or three cars without any change. Fortunately, very few timbers are necessary, but when they are used they are set by a special timberman.

While rooms are advancing, the coal is cut only at the face, except when crosscuts and slants have to be driven. When removing pillars, slabs sometimes are taken off the ribs and sometimes a place is driven across the pillar, which pillar is normally 22 ft. through.

Crosscuts are driven at right angles to the pillars at about 50-ft. centers and staggered. After each room is widened, a slant for the storage of cars is driven at a 45-deg. angle, cutting through the pillar about 40 ft. from the neck. Thus Room 1 connects with Room 2 and Room 2 with Room 3, and so on. One Goodman power shovel and four Joy 5-BU loaders are used on each working shift at the Monarch mine, and two Goodman power loaders and four Joy loaders at the Acme mine.

At Monarch, cars are placed by 5- and 6-ton Baldwin-Westinghouse, Goodman and Jeffrey electric locomotives with gathering reels. At Acme mine, the Joy loaders are served by reel 5-ton Jeffrey and 6-ton Baldwin-Westinghouse locomotives, and the Goodman loading machines with horses. Ten-ton Baldwin-Westinghouse and Jeffrey locomotives provide secondary haulage at the Monarch mine, and 8- and 10-ton Goodman locomotives with 8-ton Baldwin-Westinghouse locomotives and 10-ton Jeffrey locomotives at the Acme mine. Main-line haulage at Monarch mine is provided by 13- and 15-ton Goodman and Jeffrey locomotives and at Acme mine by 15-ton Jeffrey locomotives with a 10-ton Jeffrey locomotive acting as a pusher for part of the main-line haul.

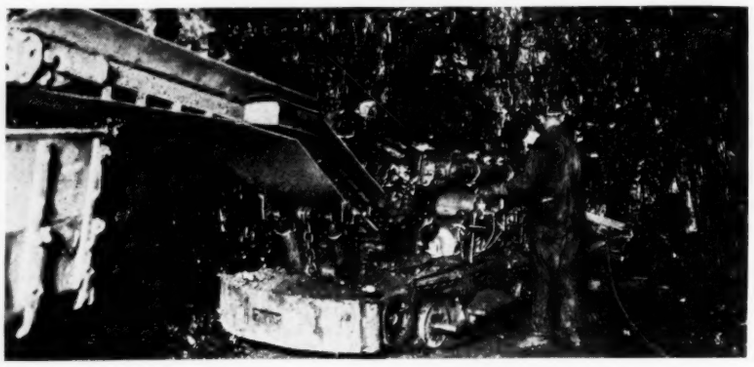
At the Monarch mine, the estimated average gathering locomotive haul is 400 ft. and at Acme 440 ft. per round trip. The round trip for secondary haulage is 8,000 ft. at Monarch mine and 7,360 ft. at the Acme mine. On main-line haulage, the locomotives haul 12,000 ft. per round trip at Monarch mine and 17,200 ft. at Acme. The average round-trip haul at Monarch is 3.84 miles and at Acme 4.73 miles.

At Monarch mine, the gathering locomotives haul 10.5 ton-miles per man or 21 tons per locomotive, secondary locomotives 570 ton-miles per man or 1,140 ton-miles per locomotive, and main-line locomotives 855 ton-miles per man or 1,710 ton-miles per locomotive. At the Acme mine, because of the lower maximum gradient of 3 per cent, as against 7 per cent at Monarch, the figures are somewhat higher. In gathering from Goodman loaders, 11.45 ton-miles are hauled per man and per horse, and from Joy loaders 12.07 ton-miles per man and 24.14 ton-miles per locomotive. In secondary haulage, the ton-miles per man are 592, and the ton-miles per locomotive, 1,184. On main-line haulage, each man and each locomotive provides 2,639.25 ton-miles, two locomotives working in tandem.

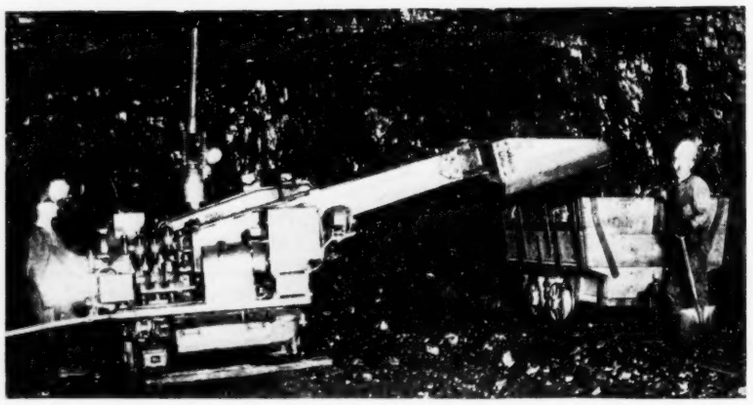
All the storage-battery locomotives are equipped with 80 A-8 Edison cells, batteries being given a boosting charge during the lunch period from a charging panel suitably located within the mine. At the close of each shift, battery locomotives are brought to the outside machine shop, where batteries are flushed or filled with distilled water with an electric filler nozzle, recharged each night by Wotton charging panels, and inspected, repairs being made if necessary. As a result of this care, batteries have hitherto shown a life of 10 years with a maintenance cost of 1¼c. per cell-day. Lighting at the face of the working is provided by the electric headlights on loading machines and gathering locomotives.

Cars make an average of two round trips daily. The older cars have a capacity of 88 cu.ft. level full, and the new cars, similarly loaded, have a capacity of 96 cu.ft. Wheels are of 16-in. diameter, the wheelbase being 26 in. and the track gage 42 in. The older cars are of roller-bearing type and, loaded mechanically, transport 2.6 tons per car, or 59.09 lb. per cubic foot of level-full capacity. The newer cars have Timken tapered roller bearings, and

(Turn to page 373)



Mechanical Loader Filling Mine Car



Hydraulic Power Shovel Loading Coal

Twenty-ton Electric Trolley Locomotive

BITUMINOUS FUTURE

+ Rests on Merchandising and Mergers

By J. T. HILL

District Sales Manager
United States Fuel Co.
San Francisco, Calif.

DEPRESSIONS may be said to have one redeeming feature: They open the eyes of business men who have been lulled to sleep by the doubtful security of prosperity. Periods of economic paralysis demand greater effort and cooperation; the inefficient are weeded out; product, service, and sales and advertising policies are improved; economies are instituted. Result: a steady march forward.

The coal business is no exception to the rule. With output doubling every ten years between 1860 and 1910, and reaching its peak in response to the feverish and unexpected demands of war time, it was natural that the bituminous industry should concentrate on production rather than sales. In fact, selling was prosecuted, after a fashion, only in May, June and July. During the remaining months, sales departments were kept busy explaining that car shortages and heavy demand made immediate shipment impossible. In the West, in addition, passage of the federal "Leasing Law" in 1920 acted as a further stimulus to expansion, in that it eliminated heavy investments in coal lands, and through the minimum tonnage clause automatically spurred lessees to exceed minimum output to secure the lowest royalty rate.

With the year 1922, however, the industry entered a new period in which the ability to produce far outstripped demand. The natural procedure when demand exceeded supply, which generally was the case before 1922, was to select a manager or director of policies schooled in production. Now that capacity is in excess of demand and probably will remain so for the next decade, it seems logical that company policies should be guided by men versed in marketing and distribution problems.

One of the fundamental problems in efficient marketing and distribution is proper education. A major obstacle in the path of education, however, is precedent. We are afraid to abandon the practices of the past. What is needed is a recognition of the fact that changed conditions require a change in policy. We have come a long way from ox-cart days, but even at the present time some of the methods and appliances used in burning coal hark back to pioneer times. Organizations marketing equipment for substitute fuels follow the modern merchandising rule: "Know your product and, through intelligent sales effort, acquaint the user with its advantages." As coal men, we can learn from our competitors. "Know coal and its efficient utilization" should be our slogan. While a highly technical knowledge of coal, its production and utilization may not be necessary, the fundamentals of efficient combustion should be acquired if we expect to stay in the industry.

One of the ironic aspects of the present situation is the increase in efficiency that has accompanied the rise in productive capacity. Heat recovery per pound of coal, however, has progressed almost to the *n*th power, and probably the gains of the next decade will be much less than those of the last. And this increase in efficiency, through the use of pulverized-coal burners and mechanical stokers, probably in the end will enable coal to regain some of the tonnage lost to liquid and gaseous fuels. The electrical equipment of today is one of the reasons why substitutes are able to advertise automatic heat. This same equipment, in conjunction with mechanical coal burners, also will put coal on the same basis as far as automatic features are concerned, with the added advantages of dependability, economy, safety, cleanliness and stable source of supply.

How to balance excess productive capacity with demand is the real problem facing the industry. While we focus our attention on substitutes, our keenest competition is between companies within districts and between districts as a whole. A careful analysis of this statement should furnish the key to recovery. Certainly, in every producing district there are officials who appreciate the economies and advantages of a consolidation of interests. Therefore, a frank, honest and open discussion of markets, plant equipment and coal reserves between neighbors should result in a workable consolidation plan which might conceivably net a saving of 25 per cent through the elimination of duplicate managements. The success of this consolidation would serve as an example to others, and its extension to cover competing districts automatically would fit demand to production. Then, effort could be concentrated on the problem of increasing consumption and regaining at least a part of the tonnage lost to substitutes. The idea of consolidations on such a scale is not new, as other industries have profited by them.

The normal yearly production of bituminous coal generally is placed at 500,000,000 tons, of which aproximately 100,000,000 tons is distributed through retail outlets. The National Coal Association and the National Retail Coal Merchants' Association offer effective mediums for successfully merchandising coal. If only 1c. per ton were set aside by the producers and retailers together, the impressive sum of $5,000,000 annually would be available for the promotion of coal use. Utilization of this money, if backed up by the constructive merchandising efforts of established sales organizations working in conjunction with retailers and manufacturers and distributors of coal-burning appliances, would put coal back on its war-time basis of "the most essential of the essential industries."

Summing up, coal men should give serious consideration to a program made up of the following:

1. A knowledge of coal.
2. A knowledge of combustion sufficient to assure efficiency and economy to the consumer.
3. Appreciation of the advantages of collective, constructive effort.
4. Prosecution of educational work through national magazines, the daily press and the radio.
5. Consummation of consolidations and mergers, distributing the savings of the consumer in the form of lower prices, to the miner in the form of higher wages and to capital in the form of increased dividends.

CANNOT HAVE SAFETY

+ Without Safe and Sound Men

Say Experts in Accident Prevention

MANY MEN are ill-fitted physically to meet the dangers of underground work. Not a few are "accident repeaters," showing physical inability to avoid accident. But discipline also is essential, so speakers declared at the meeting of the Mining Section of the National Safety Council held at Chicago, Oct. 3 to 5 inclusive, at which T. E. Lightfoot, engineer-in-charge accident prevention, Koppers Coal Co., Pittsburgh, Pa., presided.

A fatality rate for the first eight months of 1933 cut from 3.17 to 2.62 per million tons, which former was the rate for the first eight months of 1932, was the pleasing record of the coal industry, presented by Daniel Harrington, chief, Health and Safety Branch, U. S. Bureau of Mines, in his annual report to the Mining Section. Though there were 57 fewer deaths in the present year than in the previous comparable period of 1932, coal output had increased about 24,000,000 tons.

"How much do coal-mine accidents cost?" asked C. E. Bockus, president, Clinchfield Coal Corporation, New York, N. Y. "I have seen all kinds of estimates and, at best, they are only reasonably intelligent guesses. I classify accident costs as: (1) actual cost to operating company under employers' liability or compensation laws, or in damage to property; (2) loss of wages due to enforced idleness of the injured; (3) loss to morale where workmen are frequently injured; (4) loss of effectiveness of workers who have suffered serious accident."

Despite efforts of the Clinchfield Coal Corporation to reduce accidents, they cost that company directly, said Mr. Bockus, more than the salaries of all mine foremen and assistants; more than the expense under either of the items "hoisting and loading" or "ventilation and drainage." By cost, Mr. Bockus explained, he meant what was paid out in 1932, irrespective of the year in which the accident occurred. But the cost of accidents that happened in 1932 was of itself more than the charges for "ventilation and drainage." Under all four headings of loss to operator and employee, the burden was far more than double the direct expense to the employer.

"A happy, disease-free, normal individual is more capable of performing a task with safety to himself and fellow workmen than a sickly, diseased, malformed and crippled, abnormal individual," declared W. C. Mays, plant physician, Elkhorn Piney Coal Mining Co., Stanaford, W. Va. Such ailments as syphilis, heart disease, tuberculosis, rheumatism, neuritis and diabetes slowly but surely undermine a man's vitality, his better judgment and his capacity to think clearly.

At the Elkhorn Piney mines entries are made on an employment card covering the man, his family history, his past diseases, his operations if any, his acute illnesses, the diseases of his childhood, accidents he has suffered, compensation paid on each, time lost from each accident, name and ages of dependents, also a description of the man, his amputations and scars, his weight and height, place and time of birth, where last employed and in what capacity.

In the examination room, after he is stripped he is carefully inspected, particularly for deformities, skin eruptions, glandular enlargements, hernias, scars and condition of joints. Condition of heart, lungs, thyroid, teeth, gums, eyes, ears, spine and joints is examined. Flexibility of spine and of all movable joints is noted. Examination is made for flat foot and hammer toes. Blood pressure is measured and blood and urine taken for test. The man is then passed for duty or rejected. If passed, he is classified and assigned to work to which his physical condition is suited and in which he can perform his duties with safety to himself and others.

Men at the Stanaford mines are divided into four classes. The A-class men range from practically perfect individuals to those with only slight imperfections, showing good muscular development, no recognizable disease deformities or abnormalities, and men also not so large as to be clumsy and awkward. They are used as loaders, machinemen, brakemen, drum runners and motormen (who handle man-trips), hoistmen and electrical repairmen. B-class men, who have no recognizable disease, are used as motormen, trackmen, pumpers, inside mechanics; a few are used as loaders where working conditions are good and likelihood of injury is not great. C-class men's duties are confined to outside tipple work, outside haulage, handling of materials, timbering projects, truck driving, substation operation and other outside jobs. D-class men, who show many diseases, deformities and malformations, are used for common labor, such as ditching, as outside trackmen, section men, sand dryers, car greasers, janitors and slate pickers.

Men who handle man-trips, electric hoists, monitors and drums, and those also who have other occupations where an accident would jeopardize the lives of other men are closely checked, usually every three months, and are often found not up to standard. A bad heart, high blood pressure, hardened arteries and many other conditions may be found that may be disastrous to them and others.

Dr. Mays gave the injury record of a mine employing on an average 600 men and producing daily about 2,800 tons for a 10-year period. No physical examination was required, and accident rate was exceedingly high.

Table I—Accidents at a Mine With No Examination or Classification

Year	Accidents	Fatalities	Tonnage
1918	128	5	486,000
1919	142	4	437,000
1920	110	4	422,000
1921	126	6	521,000
1922	135	4	495,000
1923	101	5	482,000
1924	107	3	471,000
1925	116	5	452,000
1926	127	6	437,000
1927	132	4	502,000

Of the 46 fatalities, 31 in the 10-year period were of men found to have imperfections and disease of sufficient degree to handicap them severely in their duties underground. Loss of arms, loss of legs, previously fractured spines, stiffened joints, asthma, syphilis, muscular rheumatism, diabetes, tuberculosis, and leaking and enlarged hearts were among diseases and abnormalities found.

After compulsory examination and classification of new men and voluntary examination of already employed men was instituted, the record was as set forth in Table II. At the same time, a lost-time accident was rerated as one where a man lost only a day by accident. This would have increased the number of accidents recorded, had not examination greatly improved the record.

In 1928, though tonnage had increased, accidents decreased from over 100 to 45, and 20 of these were of a minor nature. In the next year, the accident rate was still lower; though the injuries were of a more serious nature, the men who sustained them being inherently sound, the time lost was reduced; the fractured back was doing duty in four months, the compound fractured part in five months and so forth.

In discussion, Dr. Mays said that he did not X-ray employees for classification. John Campbell, insurance manager, Eagle-Picher Mining & Smelting Co., Joplin, Mo., said that his company makes one, and sometimes two, pictures. An X-ray of the lower spine is obligatory. Three per cent of those examined show a six-lumbar spine. The detection of abnormal back conditions has put a stop to lifting accidents. Sometimes the lungs are X-rayed. The Eagle-Picher Co. has an E class for those with active venereal and tubercular trouble.

The comptroller and treasurer of every company should be furnished with reports showing cost of accidents, compensation, insurance, etc., said H. A. Reninger, special representative, Lehigh Portland Cement Co., Allentown, Pa. Noting that the cost of compensation is decreasing, they will not be hesitant to approve bills presented for safety work. The engineering department should be furnished with reports and charts showing accidents, days lost, man-hours and days lost per 100,000 man-hours and production.

Table II—Accidents at the Same Mine After Examination and Classification Was Instituted

Year	Accidents	Fatalities	Tonnage
1928	45	1	600,000
1929	39	1	563,000
1930	44	2	553,000
1931	49	2	461,000
1932	35	1	443,000

At the session of Oct. 4, Theodore Marvin, editor, *Explosives Engineer*, Wilmington, Del., urged that manufacturers follow through their sales with an effort to promote the safe use of their products as explosives makers had done. By "following through," blasting safety has been achieved, though explosives are essentially dangerous tools. The

T. E. Lightfoot
Who Presided at Sessions

fatality rate in 1930 per million man-hours underground for explosives in the bituminous coal mines of the United States was 0.048 (or one death for every 20,833,000 man-hours). The non-fatal injury rate was 0.733 (or one injury for every 1,360,000 man-hours of underground exposure). It should be noted that, in bituminous coal mines, mine cars and locomotives caused 17,120 accidents in 1930; explosives, only 475. Haulage caused 285 fatalities; explosives, 31.

Discipline, wrote Cadwallader Evans, general manager, Hudson Coal Co., Scranton, Pa., in a paper read by Mr. Metzger, in the former's absence, has to be enforced on both officials and workmen. Two years ago written reports of injuries were required only when fatal or caused by explosions of gas. As accidents did not decrease materially, it was ordered that every injury from a fall of roof or rib be reported to the general manager by the sectional foreman in his own handwriting, this report being routed to the foreman and colliery superintendent, who indorse their comments and forward them to the general manager. The reports are not filed with the safety department until requests have been made for more and clearer data and the responsibility of the officials through whose hands the reports have passed has been stressed. This seems to have bettered the accident record.

Today, under the "standard discipline," each employee offending is given a hearing before his mine foreman or superintendent before suspension or discharge, only superintendents having the latter power. Until about 1930, section foremen, declared Mr. Evans, did not have power to suspend men under their control but had to report them to the foreman, thus weakening their authority; but, when a man is thus suspended, he is told to report to the mine foreman promptly, when his case is discussed by the man, the section foreman and the foreman. The foreman can lengthen the suspension if he sees fit. Thus, suspension of men violating rules becomes a duty of the section foreman, but, failing to instruct the offending miner, part of the blame is placed on him.

A record of each employee is started, said Mr. Evans, as soon as he registers, and on this record is placed every offense which he commits, with the resultant discipline, and every injury he sustains. Thus, colliery officials can "talk turkey" to any man when he returns to work after an injury or a suspension. Reckless and careless men thus known are not favored for reemployment. When an injured man returns to work, he reports to his mine foreman, who frequently suspends him for violation of safety rules.

Mr. Lightfoot noted with interest that at these mines, which are fully unionized, discipline nevertheless is enforced. Some are wondering how their safety records and 100-per cent first-aid instruction will fare with unionization. An Illinois man declared that the union accepted first aid more readily than some foremen. In the State of Washington, said S. H. Ash, district engineer, U. S Bureau of Mines, the 100-per cent first-aid movement originated at union mines. The practice of the Koppers Coal Co., said Mr. Lightfoot, is to suspend a man one day for the first offense, three days for the second and to discharge for the third offense, with the record cumulative for only one year. As section foremen may be animated by spite, it seems better to limit their powers of suspension by definite rules. All discipline must be reported to headquarters. Unfortunately, some officials administer discipline and fail to enforce it, especially if in need of coal.

In the anthracite region, said Mr. Metzger, safety engineer, Hudson Coal Co., Scranton, Pa., the union recognizes the agreement of 1902; if the operating officials have that on their side and take a fair stand, they can discipline offend-

ing men. A one- or two-day layoff is not a penalty but a vacation, said John Treweek, safety engineer, Homestake Mining Co., Lead, S. D. "We don't give a man a suspension of a day or two but one of 15 to 29 days. We don't give them 30 days; that, under the rules, would compel a man to go through the medical examination, just as if newly hired. On the second offense, the man is discharged."

Safety work at the mines of the Union Pacific Coal Co. cost for labor and material from 1923 to 1932 inclusive from 2.2 to 5.5c. per ton, said Eugene McAuliffe, president, Omaha, Neb. Large sums were spent in removing physical hazards and efforts made to inspire a safety spirit; a competent safety engineer was employed; local and general safety meetings were held, and books, flags, framed paintings, household silverware, watches, etc., awarded to the individual and district producing the best results, but little improvement resulted.

So two automobiles were offered as prizes for the best performance shown in the last half of 1931. The mines were then districted, with a foreman in charge of safety in each district. Records of lost-time accidents and man-shifts by districts were established. Cash prizes were paid foremen of districts receiving an automobile, and all men passing through the period without an accident were given equal opportunity to obtain an automobile. A legend put on the car shows the name of the winner and reason for award. The company repaints the automobile when needed and restores the legend. Thus, the car is a permanent record of the award and a potent advertisement of safety and its reward. In 1932, the plan was made to cover the entire year. Table III shows the results obtained.

Table III—Accident Record, Union Pacific Coal Co., 1930-1932

Year	Tons Mined	Man-shifts Worked	Fatal Accidents	Non-Fatal Accidents
1930	2,897,653	484,081	8	276
1931	2,453,527	396,198	6	157
1932	2,045,270	325,902	1	60

	Tons Mined per Accident		Man-shifts Worked per Accident	
	Fatal	Non-Fatal	Fatal	Non-Fatal
1930	362,207	10,499	60,485	1,754
1931	408,921	15,626	66,033	2,524
1932	2,045,270	34,088	325,902	5,432

In the first half of 1933, man-shifts per lost-time accident increased 52 per cent over the first half of 1932, showing that the good work is continuing. Every employee, said Mr. McAuliffe, attempts to police not only himself but his neighbor, and the unlucky victim of a minor accident is sometimes given scant sympathy.

Early in 1933, the eyesight of all employees was examined, and every man above and below ground equipped with super armor-plate spectacles, to be worn constantly on duty. About 28 per cent of the employees had defective vision, so corrective spectacles were furnished. Many, said Mr. McAuliffe, learned for the first time what good eyesight meant. All are equipped with protective hats; those subject to foot injuries wear hard-toed shoes, and a drive is under way to equip everyone with protective gloves.

Bonus systems have been introduced in the Bell & Zoller Coal & Mining Co.'s mines, said John Lyons, safety engineer, and this, with other changes, appears to have cut down accidents. Prizes of $150, $75, $50 and $25 were awarded each year to the foremen with the least number of accidents regardless of man-shifts. Later the sums were aggregated, and prizes divided proportionally to the number of man-shifts worked. Still later, the boss at each mine reaching a certain severity rate was given $15 at the end of the year. This later was cut to $10, and the award made for improving the former severity rate.

At the mines of the Koppers Coal Co., inside foremen are awarded a maximum of $15, and outside foremen a maximum of $7.50 monthly on their safety records, said R. S. Long, mine superintendent, Elk Ridge, W. Va. Mr. Lightfoot said that the "safety dividends," or bonuses, paid by the Koppers Coal Co. have, at times, reached $2,000 in one month. At the Elkhorn Piney division of the Koppers Coal Co., said R. C. Estep, safety inspector, an honor roll of the section foremen who have gone a full year without a lost-time accident is posted. Once on the roll, the foremen want to keep their names there and work hard to that end.

Pocahontas No. 3 division of the Berwind-White Coal Mining Co., said another, pays each foreman a bonus of $10 per month for every month during which he has had no lost-time accident. A fatality incapacitates a mine foreman for six months from receiving a bonus. The New River division had relinquished its bonus but is planning its reestablishment.

Bonus systems have decreased accidents for the Homestake Mining Co., declared Mr. Treweek. Men working 300 or more shifts are given a bonus of $10 at the end of the year if they have not had a single lost-time accident. An award of $5 a month is given to each underground boss supervising 300 or more man-shifts if his record is similarly clear, and $20 for six months and year if frequency rate is under 62.5 per 1,000,000 hours worked, and $20 if severity rate is less than 0.5 shift per 1,000 hours worked.

The Electro-Metallurgical Co., Alloy, W. Va., gives a "big feed" once a year, but no bonus, said Romie Craigo, motorman, but has gone 2 years and 200 days without a lost-time accident. Ground foremen at the mines of Eagle-Picher Mining & Smelting Co., which has 400 to 600 employees, receive a bonus for

Officers of the Mining Section, National Safety Council, for the Ensuing Year

General Chairman: P. M. Arthur, director of personnel, American Zinc Co. of Tennessee, Mascot, Tenn.

Vice-Chairman in Charge Membership, Coal Mining: F. B. Dunbar, general manager, Pickands, Mather & Co., Mather, Pa.

Vice-Chairman in Charge Membership, Metal Mining: J. W. Alt, safety engineer, Calumet & Hecla Consolidated Copper Co., Calumet, Mich.

Vice-Chairman in Charge Engineering: W. G. Metzger, safety engineer, Hudson Coal Co., Scranton, Pa.

Secretary and *News-Letter* Editor: Daniel Harrington, chief, Health and Safety Branch, U. S. Bureau of Mines, Washington, D. C.

Entertainment Committee Chairman: J. T. Ryan, vice-president and general manager, Mine Safety Appliances Co., Pittsburgh, Pa.

Poster and Slide Committee Chairman: J. J. Forbes, supervising engineer, U. S. Bureau of Mines, Pittsburgh, Pa.

Program Committee Chairman: R. N. Hosler, superintendent, Coal Mines Section, Pennsylvania Compensation Rating and Inspection Bureau, Harrisburg, Pa.

Publicity Committee Chairman: M. R. Budd, associate editor, *Explosives Engineer,* Wilmington, Del.

Statistics Committee Chairman: W. W. Adams, chief statistician, Demographical Division, U. S. Bureau of Mines, Washington, D. C.

Executive Committee Members at Large: W. H. Comins, local manager, National Lead Co., St. Francis, Mo.; M. F. Fairlie, manager, Mining Corporation of Canada, Ltd., Toronto, Canada; C. W. Gibbs, general manager, Harwick Coal & Coke Co., Pittsburgh, Pa.; H. C. Henrie, personnel director, Phelps Dodge Corporation, Bisbee, Ariz.; T. E. Lightfoot, engineer in charge accident prevention, Koppers Coal Co., Pittsburgh, Pa.; Lee Long, vice-president, Clinchfield Coal Corporation, Dante, Va.; George Martinson, safety engineer, Pickands, Mather & Co., Hibbing, Minn.; D. D. Moffatt, general manager, Utah Copper Co., Salt Lake City, Utah; M. W. Price, safety engineer, Jeddo-Highland Coal Co., Jeddo, Pa.; L. T. Sicka, general manager, St. Joseph Lead Co., Bonne Terre, Mo.; Howard I. Young, president, American Zinc, Lead & Smelting Co., St. Louis, Mo.

that month which passes without a lost-time accident to any of their men, said John Campbell, insurance manager, Joplin, Mo. Its lost-time accident record is on the one-day basis. Each foreman gets 1c. per man-shift for any month in which he has no lost-time accident. Of those mines that have lost-time accidents the foreman who has the best rating is given ½c. per man-shift, but he receives this bonus only if he goes clear the following month, in which event he receives both the ½c. bonus and the clear-record bonus.

Good results are being obtained. A foreman at a mine where accidents are so severe that they are often accompanied by infection has gone a year without a lost-time accident. The bonus established in 1925 has proved worth while. Every workman gets a pair of canvas gloves every month that the mine in which he works has operated without lost-time accident. Bonuses cost the company $75 to $100 per month.

Safety, like any operating problem, is a matter of efficiency, said R. H. Seip, chief of safety division, New Jersey Zinc Co., Franklin Furnace, N. J. If low cost, efficient maintenance and other favorable operating conditions can be attained by holding foremen responsible, why not safety also? Three years ago his company abolished the bonus, and since then it has cut accidents 90 per cent.

Motion pictures of native mining, titled in African dialect, and a talkie mostly in the same or a similar dialect were shown by Edmund Steinburg, secretary, prevention of accidents committee, Rand Mutual Insurance Co., Ltd., Johannesburg, Transvaal, South Africa. Mr. Steinburg declared that fuses are sent into the mine crimped to the detonator, thus eliminating crimping and the danger of "stray" detonators. Central stations will be established in the mine for preparing primers.

In all, 110 different persons registered at the three sessions of the Mining Section. J. E. Long, superintendent of safety, Delaware & Hudson Railroad Corporation, Albany, N. Y., was elected president of the National Safety Council for the ensuing year. W. H. Cameron continues as managing director.

RECORD PERFORMANCE

In Sheridan-Wyoming Mines

(Concluded from page 368)

haul 3 tons per car when loaded by machinery, or 2.8 tons per car, mine average, which is 58.33 lb. per cubic foot of capacity, level full. Cars are about 48 in. high above the rail. The wheels have clearance of about 1 in. under the body of the car, the sides of which flare out over the wheels on either side. The maintenance cost for 1932 for all the cars in use was: labor, 0.16c.; supplies, 0.08c.; a total of 0.24c. per car-day. At least 95 per cent of this cost was for the repair of old cars. All cars have wood bottoms, but the new cars are of the composite type. The old cars weigh 3,200 lb. and the new ones 3,400 lb.

The Timken roller-bearing cars roll more freely than those formerly purchased, maintain their gage, require less maintenance, increase the size of the trip one-fifth and reduce transportation cost. Since these cars have been in use, only one bearing, costing $3.05, has had to be replaced. The length of service of these cars to date (May 25) can be gathered from the following data: 100 were installed May, 1928; 30 in June, and 20 in December of the same year; 35 in May, 1929; 25 in September and October, 1930, and 10 in January, 1931. There are, therefore, 220 of the newer type of cars, and they have been running a total of over 961 car-years, the oldest of them 5 years. During that time, not a wheel of the new cars has broken or an axle bent, and the maintenance cost, except as stated, has been nil.

All of which has its relation to accident reduction, for at most mines transportation employees have an extremely high average accident rate. Improvements in track also are credited with some of the decrease in accidents. Close inspection of haulways, tracks kept clean and well drained and loose coal on ribs trimmed or pulled down, roadways well lighted and danger signs posted are other means by which the Sheridan-Wyoming Coal Co. attacks the ever-present haulage hazard. All locomotives have warning gongs. As a result of these precautions, haulage accidents have been materially reduced.

Falls of coal have been infrequent, so protective hats are not used, but the protective shoe is being introduced. Men using picks have for five years been required to use goggles, and experiments are being made in the use of glass instead of wire mesh for the purpose. Perhaps the safety hat and shoe might have been adopted earlier, but the company's philosophy is to seek to remedy every dangerous factor first rather than to introduce protective apparatus that may be burdensome to the employee. Men are neither required nor forbidden to wear gloves. During the year 1932, one man had a crushed finger and lost about two months' time, for which $167.65 was paid, but that was the only accident involving the hands.

At Monarch mine, every place is sprinkled after the coal is shot, so as to prevent the rise of dust when the coal is being loaded. Pipe lines are carried to every working place. Rock-dust barriers are placed so as to isolate each panel. Main and face entries are rock-dusted on the ribs and top. The floors of main haulages are sprinkled by a water car with a capacity of 500 gal. A large part of the Acme mine is quite wet, so little sprinkling is done and no rock-dusting.

Mine examiners inspect the mines each day before the men enter; all the men are provided with life checks. Tampers who charge shotholes are provided with electric safety lamps. Each section of the mine is ventilated by a separate split. After each coal panel is mined out, the two openings leading to the panel are immediately sealed with concrete, the stoppings being set 14 in. into the bottom and 12 in. into the top. Though the coal contains only a small quantity of alkali, the coal fires spontaneously and that characteristic must be carefully watched.

The low accident rate is credited in part to the long experience of the men in the mines of the company and their consequent adjustment to the conditions existing. Labor turnover is very small, and there are no floaters. Living conditions are unusually favorable, and employees recognize the consideration shown them, but discipline as regards safety is never relaxed. In each section of the mine, sufficient M.S.A. self-rescuers are provided to afford emergency protection in case of an explosion. Each face foreman carries an M.S.A. Eveready first-aid packet No. 2A against any emergency. A close check is kept of all first-aid material in each section of the mine.

Through its industrial accident fund, the State of Wyoming insures all employees engaged in extra hazardous occupations. The cost per ton for injuries to employees during the calendar years 1926 to 1932 was as in the accompanying table.

Cost Per Ton Compensation and Catastrophe Insurance, Sheridan-Wyoming Coal Co., 1926-1932

Year	Compensation Insurance and Service Charge Per Ton	Catastrophe Insurance Per Ton	Tota for Items 1 and 2 Per Ton
1926	$0.0146	$0.0023	$0.0169
1927	0.0139	0.0021	0.0160
1928	0.0163	0.0020	0.0183
1929	0.0193	0.0016	0.0209
1930	0.0244	0.0016	0.0260
1931	0.0188	0.0016	0.0204
1932	0.0169	0.0013	0.0182
Average	$0.0175	$0.0019	$0.0194

Note: The item for catastrophe insurance (which is defined under the Wyoming Compensation Law as a disaster causing payment of more than $25,000 under the compensation law) is a reserve with the State Treasurer.

INDUSTRIAL USES OF COAL

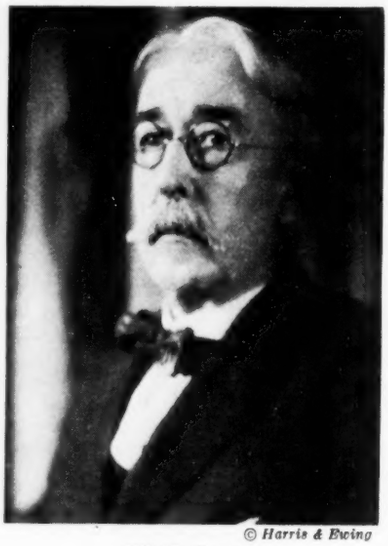
Discussed at A. I. M. E. Meeting

AVAILABILITY of coal for use in industry received broad treatment at the joint meeting of the Coal Division and Ohio Section of the American Institute of Mining and Metallurgical Engineers in the Battelle Memorial Institute, Columbus, Ohio, Oct. 27 and 28. At the morning session, C. E. Lawall, director, School of Mines, University of West Virginia, Morgantown, W. Va., presided.

Unable to list relative costs of coal, oil and gas for all the many domestic markets in the United States, R. A. Sherman, fuel engineer, Battelle Memorial Institute, Columbus, Ohio, took the Columbus domestic fuel market as examplar and, assuming cost of Pocahontas lump at $7.25 per ton, Hocking stoker coal at $4.50, No. 3 fuel oil at 6.5c. per gallon, and natural gas at 55c. per thousand cubic feet, he found that in a typical Columbus home which would burn 15 tons of Pocahontas coal, the annual cost for fuel, with amortization, repair and interest on burning equipment, excluding furnace, with Pocahontas lump, would be $112.20 annually; with Hocking stoker coal, $133.25; with fuel oil, $216.22; and with natural gas, $207.10. Intangible savings with the last named two fuels properly burned are less dirt, less cost for the cleaning of walls, drapes, rugs and clothing, and additional space in basement. With the stoker, oil and gas furnaces thermostatically controlled, uniform temperatures also can be attained.

Anthracite furnishes more even heat than oil, declared A. J. Johnson, director, Anthracite Institute Laboratory, Primos, Pa., and the quantity of solid matter discharged into the air, by volume, with oil is about 3.3 times, and with high-volatile bituminous coal is 443 times, that with anthracite. The dust from the first is hard and granular, and that from the other two both oily and sooty. He said that 185 lb. of hand-fired chestnut, 169 lb. of stoker-fired buckwheat and 173 lb. of buckwheat, when magazine-fired, produced as much heat as a gallon of oil.

At the afternoon session, B. M. Bird, research engineer, Battelle Memorial Institute, presided, and H. M. Faust, research engineer, Ohio State University, Columbus, Ohio, in an address broadly covered "Power Plant Developments and Their Effect on Coal." Under certain conditions, he declared, sulphur in coal and in the products of combustion is a detriment, but, as observation indicates, sulphur is blamed many times for power-plant ills actually due to other conditions. Surplus moisture in coal, he added, is conceded to be an asset with the chain grate and in some other types of combustion. Some declare that 5 to 10 per cent of moisture materially increases capacity and efficiency; some that moisture acts as a catalyst, improving combustion; and others that moisture gives a better and more porous fuel bed, reducing the caking of the coal and causing it to burn more uniformly. Lowered caking reduces maintenance costs.



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Eli T. Conner
Chairman, Coal Division, A.I.M.E.

In some common brick plants crushed anthracite is mixed with clay to accelerate burning and to even the temperature of the kiln; this increases percentage of salability and makes lighter brick. Bituminous coal may be used, said H. E. Nold, professor of mining engineering, Ohio State University, Columbus, Ohio, but it is not as satisfactory as anthracite. Between 50 and 60 lb. of coal is used per 1,000 bricks burned. Evidence was presented by Prof. Nold to show that a long-flaming coal was not necessary for periodic-kiln heating, a low-volatile coal being desirable for a non-flashed oxidized product.

One Ohio brick manufacturing company, said Prof. Nold, fires its face and common brick with natural gas from its own wells and reports that the gas consumed averages from 12,500 to 13,000 cu.ft. per thousand brick. For common brick, 10,000 cu.ft. may suffice, and face brick may require 15,000. The average coal consumption for firing this quantity of face brick in Ohio is 1,320 lb. per thousand brick. Assuming an average calorific value of 12,600 B.t.u. for coal, 13,000,000 B.t.u. from gas does the same work as 16,632,000 B.t.u. from coal.

The Hill Brick Co., of East St. Louis, Ill., reports a natural-gas consumption of from 9,146 to 12,570 cu.ft. per thousand brick, with gas running 1,000 B.t.u. per cubic foot. Charles Butz, chief engineer, Denver Fire Clay Co., was quoted by Prof. Nold as stating that 23,000 cu.ft. of 840-B.t.u. gas, or 19,320,000 B.t.u., is equal to one ton of 12,500-B.t.u. coal, or 25,000,000 B.t.u. Prof. Nold declared that producer gas is a desirable fuel and profitable in some of the larger plants. Natural gas has largely replaced coal for the firing of the finer wares. It cannot compete with coal in firing heavy clay products except in regions where cheap gas is available.

Difficulties with the small consumer are greater than with the large corporation, said C. A. Reed, chief combustion engineer, Pittsburgh Coal Co., Pittsburgh, Pa., for if he gets a car of coal which he has difficulty in using, it lasts him so long that it gives him a long period of grief. The larger consumer has trouble for a brief hour or so and forgets it because it is of short duration. For this reason, every care should be taken with the small consumer.

Speakers at the banquet were Eli T. Conner, chairman, Coal Division, Scranton, Pa.; A. B. Parsons, secretary, A.I.M.E., New York, N. Y.; and Howard N. Eavenson, vice-president, A.I.M.E., Pittsburgh, Pa. Results under the NRA bituminous coal code, said Mr. Eavenson, are: Complete unionization; no chiseling of wages; radical change in the competitive relationships between districts; little bettering, if any, of competitive conditions with oil; increased difficulty in meeting gas competition; overcapacity hardly changed, and competitive position of large, well-organized and well-managed companies improved. During the next ten years 400,000,000 tons of bituminous coal will be considered a large annual national output. He suggested that, as coal production required more men than gas or oil production, a tax of 1½c. per gallon of fuel oil and 15c. per thousand cubic feet of natural gas be imposed beyond, say, 50 miles from point of production. Suggestions had been made that, to cure excess output, railroads be ordered to refuse connections to new mines or that the government purchase all unopened coal land not needed by present owners for 50 years, said land to be held and to be leased later on royalty.

Mr. Conner was nominated for re-election as chairman; J. T. Ryan, vice-president, Mine Safety Appliances Co., was nominated for vice-chairman.

FLOATING AND FILTERING COAL

+ Methods and Results

By DR. ERWIN W. MAYER
Berlin, Germany

ALL KINDS of coal are not equally floatable, and even the different bands of coal in any one seam vary in floatability. Differences are observable between coal that is still dry and coal that has been wetted a long time; in general, dry coal dust is more easily floatable than the wet dust, usually designated as coal sludge.

In coal flotation, as in the floating of ores, the density of the pulp usually is so chosen that each liter of water will carry from 200 to 300 grams of solid matter, or each gallon 1.67 to 2.5 lb. If the water from washing contains less solids, it is generally led to thickening tanks to receive the desired concentration. If dust is to be treated, a pulp of the desired density is produced by suitable feeding apparatus, as, for example, revolving plate feeders. The finer the particles of coal to be handled, the thinner must be the pulp in which it is floated, and, with coal as with ore flotation, the slime in which the coal receives its final cleaning is thinner than that used in the roughing cells. To obtain a successful separation by the flotation method, the density of the slime should be kept constant.

In ore flotation, as is well known, chemical flotation agents, especially the collecting reagents, have to a large extent displaced oils, which formerly were used to the exclusion of all other reagents, whereas, in practical coal flotation, oils have continued to hold their own. Chemical collecting reagents, though in part efficient, have made no headway. In general, such oils are used as are produced in the coke plants connected with the washery—that it, products of coal-tar distillation. These are less costly than the chemical frothers and collecting reagents used in ore flotation. Most frequently benzol wash oil is used, but naphthalene oil, anthracene oil, crude phenol, cresols, creosote oils, cresylic acid, coal-tar fuel oil, water-gas tar, occasionally waste waters containing phenol, ammonia waste water and waste water from coke-gas cleaning plants also are employed at coal-flotation plants. Only exceptionally are

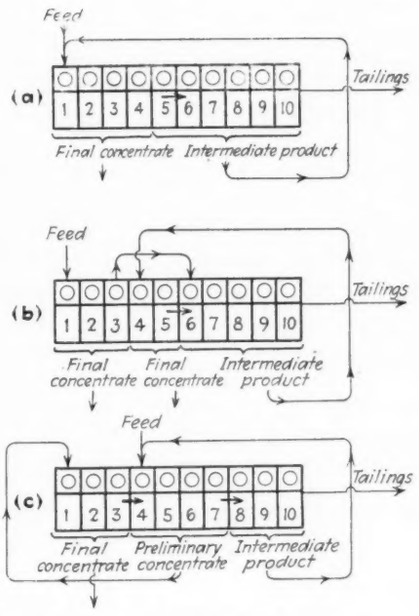


Fig. 1—Three Methods of Working Flotation Units

pine oil and other turpentine products used and then in mixture with other oils. Paraffin oil (kerosene), wood-tar oils and crude petroleum sometimes are used. Recently, amber oil, obtained from the distillation of amber waste, has been found a good flotation agent for coal.

As with ores, the quantity of flotation agents required per ton of charge varies greatly, dependent on the nature and composition of the feed, quantities between 0.6 and 4.0 lb. per net ton being the range in coal-flotation plants. Because the oils used are mostly produced in the plant itself, and because, when the flotation concentrates are fed to the coke ovens, they are again recovered in the ovens, less importance is placed on economy in the use of oils in coal than in ore-flotation plants. In German and other European plants, the oil cost, on the basis of present oil prices, is calculated at 1.5 to 5.5c. per net ton of dry material handled, but these figures vary up and down.

Because conditioning reagents are less often used, coal flotation is less complicated than flotation of ores. Where the feed contains much clay, certain peptonizers, such as sodium silicate, are added to the slime. When the coal has a particularly high clay content, the separate removal of clay by sodium silicate prior to flotation is advisable. In some cases, the addition of xanthate and some alkali may be desirable. These help to free the coal particles for subsequent oil treatment. In exceptional instances, lime is added to the flotation medium to depress pyrite, as in the experimental plant of the Pittsburgh Coal Co., where about 3 lb. of lime is fed into the water per ton of coal to raise the pH to between 8.5 and 9.

In coal-flotation treatment, equipment with mechanical agitation most generally is used; particularly the Minerals

Table I—Results Obtained in German Filter Plants Using Coal of Minus 1.5-Mm. Size

Colliery	Approximate Filter Surface, Sq.Yd.	Total Throughout, Lb. Per Hr.	Solids in Filter Feed, Lb. Per Liter	Filtrate Per Hour Per Sq.Yd. of Filter Surface Dry Weight Lb.	Water Content of Filter Feed Per Cent	Hourly Output of Air Pump, Cu.Yd.	Approximate Total H.P. Needed
Kokswerke and Chem. Fabriken Gleiwitzer Grube	20	25,500	0.73	1,340	25	3,270	30
Glueckhilffriedenshoffnung, Grube Hermsdorf.....	29	22,000	0.73	780	24–26	3,270	35
Oberschles. Kokswerke A. G., Victorgrube Neuweisstein.....	15	16,000	0.73–0.55	1,160	26	3,270	16
Ilseder Hütte, Kohlenbergwerk Meissen bei Minden	7.5	16,600	0.88	2,330	18	620	19

Separation Standard machine. This is employed at perhaps 85 per cent of the plants and has given efficient service. Up to the present, pneumatic machines have been less often used, because, with mechanical stirring, larger sizes of grain can be floated than with pneumatic agitation. With M. S. Standard machines, sizes up to 2.5 mm. (0.098 in.) can readily be brought into the froth, whereas pneumatic machines may fail to work with sizes over 0.5 mm. (0.02 in.).

Because, in coal flotation, much larger quantities of concentrates often have to be handled than in ore flotation, the M. S. Standard machine for coal may have 30-in. diameter stirrers (corresponding to 3.6 cu.yd. cell content), whereas in ore dressing the diameters of the stirrers never exceed 24 in.

In two Dutch and two French coal-washing plants, the Kleinbentinck machine, which is based on the M. S. Standard machine, has been introduced. A few Ekof compressed-air machines are operating in Germany. These are of the free-air type and similar to the Forrester equipment. At the Pittsburgh Coal Co. plant, MacIntosh cells are in successful operation. The coal-pulp flowsheets for the M. S. Standard machine closely resemble those in ore flotation. If the coal does not need to be made exceptionally clean, the desired product can be obtained from the first cells, the others furnishing a middling product which can be led back to the first cell for reworking, (*a*) in Fig. 1, or they may be reworked separately as in (*b*) of that illustration; in no case are the middling products subjected to grinding before this re-treatment. If the entire product is to be recleaned, the pulp flow shown in (*c*) of Fig. 1 is recommended.

Table II—Reductions of Sulphur Attained in Flotation Plants

Colliery	Sulphur in Raw Slime, Per Cent	Sulphur in Flotation Slime, Per Cent	Sulphur in Tailings, Per Cent
Moller Pits	1.63	1.19	5.10
Mont Cenis	1.22	1.10	2.15
Georg-Marienschacht	4.88	2.10	12.61
Ilseder Hütte	2.01	1.20	3.50

In mechanical flotation, especially in that of the type of the M. S. Standard machine, the pulp escaping from a cell can be sucked by the agitator blade of a distant cell; thus the mechanical stirring makes possible all the connections desired without the use of lifting devices. However, because of the large volume of froth, more difficulty is experienced in sucking the middlings or the preliminary concentrates in coal than in ore flotation. These froths usually have to be distributed by chain bucket conveyors to the cells to which they are to be consigned.

At first, the dewatering of the flotation product presented difficulties and checked the development of the process, because of the volume of product to be dewatered, its colloidal character and the necessity for a more complete re-

Table III—Details Regarding Several Flotation Plants, Their

Name of Company	Location of Plant	Capacity	Raw Material	Grain Size, In.
(1) Gewerkschaft Karl Alexander Steinkohlenbergwerk	Baesweiler, Bez. Aachen, Germany	33–42 t/h	Dust and slime	0–0.029
(2) Niederschlesische Bergbau A. G., Neu Weisstein	Fuchsgrube, Juliusschacht, Germany	33–35 t/h	Dust and slime	0–0.039
(3) Gewerkschaft Consolidierte Wenzeslausgrube, Mölke, Schles.	Wenzeslausgrube, Mölke, Germany	33.5 t/h	Slime	0–0.078
(4) Kokswerke und Chemische Fabriken A. G., Hindenburg, O.S.	Gleiwitzer Grube, Germany	22–33 t/h	Dust and slime	0–0.039
(5) Niederschlesische Bergbau A.G., Neu Weisstein	Glückhilfgrube, Germany	20 t/h	Aspirated dust and slime	0–0.029
(6) Vereinigte Stahlwerke A.G., Gelsenkirchen	Zeche Alma, Germany	18 t/h	Slime	0–0.039
(7) Niederschlesische Bergbau A.G., Neu Weisstein	Gustavgrube, Germany	14 t/h	Slime and aspirated dust	0–0.020
(8) Röchlingische Eisen-und-Stahlwerke A.G., Völklingen, Saar	Kokerei Völklingen, Germany Kokerei Altenwald, Germany	13 t/h 12 t/h	Slime Slime	
(9) Kohlenbergwerk Minden, G.m.b.H., Meissen bei Minden	Meissen bei Minden, Germany	12–13 t/h	Dust and slime	0–0.059
(10) Gewerkschaft der Steinkohlengrube Mont Cenis	Sodingen, Herne, Germany	11–12 t/h	Raw slime	0–0.039
(11) Niederschlesische Bergbau A.G., Waldenburg	Kulmiz, Melchiorgrube, Germany	11 t/h	Dust and slime	0–0.039
(12) Gewerkschaft Carolus Magnus, Palenberg Bez. Aachen	Palenberg, Germany	11 t/h	Raw slime Throughput slime from dewatering screens	0–0.039 chiefly 0–0.020
(13) Gewerkschaft Gottes Segen in Lugau	Oelsnitz i. Erzgebirge, Germany	9–11 t/h	Dust and slime	0–0.020
(14) Erzgebirgischer Steinkohlen-Aktienverein, Zwickau i. S.	Bürgeschacht, Germany	about 6.5 t/h	Slime	0–0.059
	Vertrauensschacht, Germany	4.5–5.5t/h	Spitzkasten slime	0–0.059
(15) Neunkircher Eisenwerke A.G. vorm. Gebr. Stumm	Neunkirchen, Saar	5.5 t/h	Raw slime	0–0.047
(16) Staatsmynen in Limburg	Grube Emma und Maurits, Heeren, Holland	154 t/h	Slime	0–0.03?

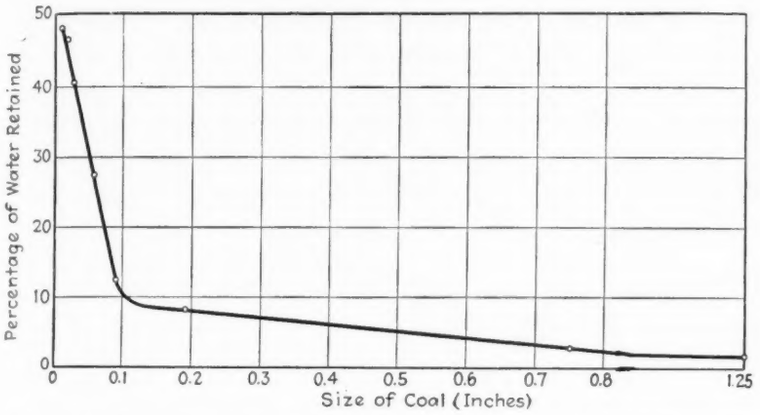


Fig. 2—Water Retained by Different Sizes of Coal After Natural Drainage

moval of the water. Froths produced by coal flotation contain from 30 to almost 100 per cent water and in general the water content ranges from 60 to 80 per cent, the quantity being greater with decreasing size of grain and with increasing ash content of the floated coal, especially if that content contains clay.

It is necessary to keep the water content of the concentrates low, as otherwise the coking process will be delayed and the coke ovens will deteriorate, decreasing their efficiency and shortening their life. In coking coal, also, constancy in water content is essential, because the ovens are drawn at certain definite intervals of time and, with too high a water content, the coke would not be ready for withdrawal at the scheduled time; whereas, if the content were too low, the coking process would be carried too far.

Composition of coal and nature of oil used play an important part, though not a decisive one, in determining the degree of dewatering attainable. Fig. 2, which is based on the experiments of R. A. Mott, gives the quantity of water retained by coal of any given size where neither pressure nor other artificial means is provided for a reduction of the moisture content.

Many attempts have been made to find ways of augmenting the natural dewatering qualities of wet coal. Small quantities of xanthate have been added to the weak alkaline pulp, coating the coal particles with a hydrophobic xanthate film. Thereby, according to F. L. Kuehlwein, *Glückauf*, Vol. 65, p. 312 (1929), water drains off more quickly and completely. It must be remembered that the coal from the flotation process is always mixed with the fine coal from washing, and this latter, by the use of dewatering belts, centrifuges and other devices, can readily be dewatered to far below 10 per cent.

A higher water content than 10 per cent is in general unacceptable to coke makers; thus the quantity of flotation coal which can be added to the fine washery coal is regulated by the content of water in the former, provided, of course, that the addition of the flotation coal does not increase the ash content unduly. As regards water content only, the more water removed from the flotation coal, the more of such coal can be added to the regular washery product.

Thus in the future it seems possible that it might become the practice to prepare all the coal above flotation size by dry methods so as to permit the addition thereto of the entire wet-flotation coal product. Dewatered or filtered flotation coal with a content of 15 to 25 per cent water, according to the size of grain, appears to be almost dry—so dry that one would not suppose it could be still further dewatered by other mechanical means. The water is bound adsorptively to the fine coal particles, so that, as A. Czermak has shown, even hydraulic pressures of 30 to 40 lb. per square foot cannot dewater floated coal below 15 per cent.

Frequently, in the early days of coal flotation, flotation concentrates were, and in many cases even today are, allowed to flow onto dewatering belts, already loaded with fine coal from the jigs. But this method of dewatering has its disadvantages and in general does not meet modern requirements. Better re-

Treatment Methods and Results

Percentage of Ash in Feed	Percentage of Ash in Concentrate	Percentage of Ash in Tailings	Percentage Concentration	Kind and Quantity of Flotation Agents Pounds Material Treated, Dry Weight	Av. Cost of Reagents Per Ton of Material Treated, Dry Weight	Total Cost of Flotation per Ton Material Treated, Dry Weight	
12–14	5–5.5	62–64	84–88	Beechwood-tar oil, 0.9	R.M., 0.07	R.M., 0.15	(1)
22	Coking Coal 5 Boiler Coal 10–15	75.80	Coking Coal about 50 Boiler Coal about 30			R.M., 0.37	(2)
19.9	8	56.4	75		R.M., 0.07	R.M., 0.15	(3)
15–20	5.8–6.2	48–63	About 60	Fresh wash oil, 9.8–12.4 lb.; ammonia water 77 gal., both per ton of concentrate	R.M., 0.35	R.M., 0.95	(4)
25	5.5	75	65	Wash oil, 2.5	R.M., 0.145	R.M., 0.59	(5)
11.5	4.8	55	50	Fuel oil, 1.7	R.M., 0.26	R.M. 0.28 per ton output 0.56 per ton concentrate	(6)
26	8	70	70		R.M., 0.23	R.M., 0.53	(7)
about 18 30	7–8 7	75–80 69	70 65	Cooling water containing phenol	R.M., 0.09	R.M., 0.25	(8)
18–19	6–7	62–66	86	Double-distilled wash oil, 3–4	R.M., 0.18–0.27	R.M., 1.18	(9)
12–14	5–5.5	65–70		Benzol wash oil and beechwood oil (1:1), 1.4–1.6			(10)
15	6	60	83		R.M., 0.08	R.M., 0.82	(11)
21	6	72.5	78	Wash oil from coke plant, 4.1		R.M., 0.82	(12)
20–24	6–8	55–60	55	Fresh benzol wash oil, 6–6.4 amber oil	R.M., 0.52	R.M., 1,27	(13)
42	12–15	80–84	50–55	Wash oil, 3.2	R.M., 0.23	R.M., 1.45	
30–40	10–12 without reflotation, 6–8 with reflotation	80–85	65–70	Charcoal tar oil, 6–8	R.M., 0.46	R.M., 1.42	(14)
35	9	70	65	⅓ petroleum, ⅔ oil residue from benzol plant	0.9 fr.	About 4.5 fr.	(15)
about 14	about 6	about 70		Naphthalene and anthracene (1:2), 1.6			(16)

Table III—Details Regarding Several Flotation Plants, Their Treatment

Name of Company	Location of Plant	Capacity	Raw Material	Grain Size In.
(17) S.A. des Charbonnages de Beeringen	Beeringen-Limbourg, Belgium	165 t. per day	Slime	0.029
(18) S.A. des Charbonnages d'Hornu et Wasmes.	Wasmes bei Mons, Belgium	88 t. per day	Slime	
(19) S.A. des Charbonnages de Liégois en Campine	Zwartberg, Limbourg, Belgium	77–88 t. per day	Slime	
(20) S.A. des Charbonnages de Mariemont-Bascoup	Mariemont, Belgium	77 t. per day	Slime	
(21) S.A. des Charbonnages du Bonnier	Grace Berlane, Belgium	55 t. per day	Dust and slime	0–0.020
(22) Cie. des Mines de Vicoigne	Noeux, France	44 t/h	Slime	
(23) Cie. des Mines de Vicoigne, Noeux et Drocourt	Lavoir 3, Noeux les Mines, France	24–27.5 t/h	Slime and dust	
(24) Cie. Française des Mines Powell Duffryn	Nantes, France	16.5–17.5 t/h	Slime	
(25) Cie. des Mines d'Aniche	Auberchicourt-Aniche, France	16.5 t/h	Raw slime	0–0.039
(26) Powell-Duffryn Steam Coal Co., Ltd.	Flotation Washery, Bargoed, Wales	49.5 t/h	Dust and slime	0–0.078
	North Washery, Bargoed, Wales	33 t/h	Dust	0–0.098
(27) William Baird & Co., Ltd.	Dumbreck Washery, Stirling, Scotland	16.5 t/h	Slime	
(28) North Bitchburn Coal Co., Ltd.	Randolph Washery, Durham, England	16.5 t/h	Slime	
(29) Manchester Collieries, Ltd.	Outwood Washery, Clifton, Lancs., Eng.	13 t/h	Slime	
(30) Teams By-Product Coke Co., Ltd.	Teams Washery, England	11 t/h	Dust	
(31) Carron Co.	Craigend Washery, Polmont, Stirling, Scotland	4.5 t/h	Slime	
(32) S.A. Hulleras de Turón	Turón, Santullano, Asturias, Spain	16.5 t/h	Slime	0–0.009
(33) S. Minera y Metalúrgica de Peñarroya	Antolin, Spain	9.5 t/h	Slime	0–0.078
	St Rafael, Spain	5.5 t/h	Slime	0–0.078
(34) S.A. Fabrica de Mieris	Mina Mariana, Ablana, Asturias, Spain		Slime	0–0.062
	Mina Baltasara, Ablana, Asturias, Spain		Slime	0–0.059
	Mina Cobertoria, Ablana, Asturias, Spain	2.5 t/h	Slime	0–0.039
(35) S. Metalúrgica Duro Felguera	La Modesta, Spain	about 55 t. of concentrates per day	Undersize from vibratory screens	0–0.073 circ. apertures or 0.020 slots
	Penarrubia, Spain	about 16.5 t. of concentrates per day		
	Maria Luisa, Spain	about 49.5 t. of concentrates per day		
	Carrocera, Spain	about 22 t. of concentrates per day		
	Barredos, Spain	about 27.5 t. of concentrates per day		
	Santa Barbara, Spain	about 55 t. of concentrates per day		
(36) S. Hullera Española	Ujo, Spain	about 198 t. of concentrates per day	Undersize from vibratory screens	0-0.078 circ. apertures or 0.020 slots
(37) S. Hulleras de Sabero	Sabero, Spain	about 13 t. of concentrates per day	Undersize from vibratory screens	0-0.078 circ. apertures or 0.020 slots
(38) S. Carbones de la Nueva	La Nueva, Spain	about 66 t. of concentrates per day	Undersize from vibratory screens	0-0.078 circ. apertures or 0.020 slots
(39) S. Hulleras Veguin y Olloniego	Veguin, Spain	about 3 t. of concentrates per day	Undersize from vibratory screens	0-0.078 circ. apertures or 0.020 slots
	Olloniego, Spain			
(40) Kaiser Ferdinands Nordbahn	Mährisch-Ostrau, Czechoslovakia	7. t/h		0–0.039
(41) Pittsburgh Coal Co.	Champion Plant No. 5, Pittsburgh, Pa.	5 t/h*	Dorr thickeners' underflow	
		10 t/h*		
		10 t/h†		

A.G., Aktiengesellschaft; O.S., Oberschlesische, Upper Silesia; G.m.b.H., Limited; S.A., Société Anonym or Sociedad Anónima; S., Sociedad; t/h, net tons per hour; R.M., reichsmark; fr., franc; ptas., pesetas. All calculations based on net tons.

Methods and Results—*Concluded*

Percentage of Ash in Feed	Percentage of Ash in Concentrate	Percentage of Ash in Tailings	Percentage Concentration	Kind and Quantity of Flotation Agents Pounds Material Treated, Dry Weight	Av. Cost of Reagents Per Ton of Material Treated, Dry Weight	Total Cost of Flotation per Ton Material Treated, Dry Weight	
25–40	7–10	75	85				(17)
35–40	9–10	70					(18)
26	9	70					(19)
25	8	70–75					(20)
30	8	70–75					(21)
61.2	20.3						(22)
20–26	70% with 4.5–6.2; 15% with 6.5–11.6; 15% with 16.5–28.2	67–77		Cresol, 0.36; petroleum, 0.20			(23)
22–42	4.2–4.5	60–70		Cresol, 0.6–1.0; petroleum, 0.36–0.46			(24)
	8.8			Tar oil (boiling point 230°–270°) 1.4–1.6			(25)
15–18 15–18	4.5 4.5	70		Cresylic acid, 0.64 per ton of finished product			(26)
15	7						(27)
15	7						(28)
15	6.5						(29)
35–50	6.5						(30)
15	7						(31)
27.3	9.3	50.3	70	Tar oil with 40% Phenol 3.4	0.93 pta. t. concentrate	3.826 ptas. t. concentrate	(32)
22	9–10	75–76	81–82	Light oil, 55%; phenol, 45% 1.8	1.0 pta.	2.91 ptas.	(33)
31	10–11	73	82	Light oil, 55%; phenol, 45% 3.8	2.09 ptas.	4.64 ptas.	(33)
38 10.8 23	10.5 10.8 11.2	55 71.5 63.9	64.5	Creosote oil, 1.02 qt./t. wet material	0.197 pta.	1.54 ptas.	(34)
about 35	10–12	70–80		Coal-tar creosote with 25 to 30% acid content; 0.96 per ton of concentrate	0.23 pta. per ton of concentrate		(35)
about 35	10–12	70–80		Coal-tar creosote with 25 to 30% acid content; 0.96 per ton of concentrate	0.23 pta. per ton of concentrate		(36)
about 35	10–12	70–80		Coal-tar creosote with 25 to 30% acid content; 0.96 per ton of concentrate	0.23 pta. per ton of concentrate		(37)
about 35	10–12	70–80		Coal-tar creosote with 25 to 30% acid content; 0.96 per ton of concentrate	0.23 pta. per ton of concentrate		(38)
about 35	10–12	70–80		Coal-tar creosote with 25 to 30% acid content; 0.96 per ton of concentrate	0.23 pta. per ton of concentrate		(39)
22–27	9–10	64–67	72–77	Charcoal tar oil, 4			(40)
9.0 9.0 10.0	5.1 6.3 7.1	68 53.4 56.5		Water-gas tar, 2; cresylic acid, 0.25; kerosene, 0.2 Cresylic acid, 0.3; solar oil, 0.5			(41)

*6-48-in. cells, Denver Equipment Co. †4x20 ft. 2-cell MacIntosh unit.

sults are obtained when the concentrates are treated in drying towers. Such towers are still being used here and there, but they have been almost entirely displaced by drum or disk filters. Attempts to remove, by centrifuges, a greater percentage of water than by filters cannot yet be regarded as successful, though individual mines have obtained satisfactory results.

With drum filters, 630 to 1,800 lb. of water per hour can be removed per square yard of filter surface, the product having a content of from 20 to 27 per cent water. If, however, the product is first dewatered to a 40 to 50 per cent content, outputs of 1,800 to 3,800 lb. of filtrate, containing 17 to 20 per cent of water, can be obtained, if the slimes are reasonably free of clay. Table I shows a few examples of the results obtained in German coal-flotation plants with rotating filters.

Such filtration per net ton of dry slime costs 6.4 to 7.3c. Of late, not only are the coal products dried by filtration but also the tailings, and this involves no special difficulties, as the quantity of such waste is relatively small. Such dewatering is recommended wherever the water is to be used again or where the tailings are to be used for stowage.

In some plants, the flotation product is dried by heat in rotating drum ovens after filtration. Such heat drying will lower the water content from 18 to 8 per cent for about 10c. per net ton, and from 18 to 3 per cent for about 13.6c., assuming in both cases a daily output of about 330 tons. Such a plant is in operation at the plant of the Powell-Duffryn Coal Co., Ltd., at Bargoed, Wales. Here, the floated coal that has been dewatered in drying towers to 25 per cent water is dewatered to from 6 to 8 per cent before coking. In a similar way, in the test plant of Champion No. 1, in Pittsburgh, the floated coal with the fine coal of the Rheolaveur process is brought to 2 to 3 per cent moisture by Christie combustion gas dryers before shipment.

Results of coal flotation, of course, depend upon the nature of the feed and on the flotation process used. In general, a suitable process will reduce the ash content of the raw slime by about 70 to 80 per cent—that is, coal containing 25 per cent of ash will produce flotation concentrates of about 5 to 8 per cent ash, an ash reduction of between 70 and 90 per cent. The sulphur reductions obtained may be judged from the table published by A. Thau, in *Stahl und Eisen*, Vol. 42, No. 30 (1922). These, however, by no means represent the best results attainable.

In general, it may be said, most of the free pyrites in the coal can be removed without difficulty. In Table III are given the results obtained by coal flotation in a number of European plants.

NOTES

. . . from Across the Sea

WITH the more frequent driving of rock tunnels for haulageways and water tunnels in the anthracite region, traversing in places highly siliceous beds, dust allaying becomes a vital problem. It is said that water jets trap only the larger dust particles and not the finer dusts between 1 and 5 microns (1/25,000 to 1/5,000 in.) in diameter, which dusts are more dangerous than coarser particles. The Pyrene Co., Ltd., of Brentford, England, is introducing a dust-allaying equipment which uses Pyrene.

Foam is produced in a 5-gal. container, which is connected with the compressed-air supply through a diaphragm reducing valve, by which the pressure is lowered to 30 lb. per square inch. Foam thus formed passes by one or several pipes to the drill or drills. Even where the drill is 120 ft. away, ½, or ¾-in. diameter hose will carry the foam to the drill.

Only 1 gal. of foam is needed per hour for the operation of the latter, whereas 1 gal. of water per minute must be used for the jet of a water-fed drill. No change in the drill steel is required when Pyrene replaces water. The nonflammable foam effectively pushes the dust out of the drill.

The system, says the *Colliery Guardian*, has been used in Germany, and also on granite, Blue Pennant and sandstone in England and is being tested in South Africa. Suggestion is made that the foam might be used with spray nozzles on floor, roof and sides of working places, on material before being broken for loading and while material is loaded.

IN French mines simultaneous shooting is permitted, provided the shots are fired electrically and the shotholes are at least 6 ft. apart, but this regulation does not apply to work in rock headings, said R. E. Ward, in a paper delivered before the Midland Institute of Mining Engineers. In longwall machine work, which ordinarily has about 360 ft. of face, as many as 30 shots are fired simultaneously. The entire face is shot in two volleys. The coal is 4 to 6 ft. thick, the undercutting is 4 to 6 ft. deep, and the shots are 6 ft. apart, started 10 in. from the roof, inclining upward and 3 to 6 ft. deep. Shots are stemmed with clay, and detonators are connected in series. The leads to the exploders are bare iron wires of 0.078 in. diameter. Before firing the charges, the area near the shots is liberally wetted.

Where large charges of explosive are required, all the cartridges are inclosed in a paper tube to prevent dust from getting between them. In six months, no unexploded cartridges have been reported. Shotfirers are instructed to insert the primer cartridge last in the shothole and to place the detonator in contact with the stemming. Exploders must not give a current of over 50 volts; the case must be strong to retain an internal explosion, must have minimum air space within it and be airtight; the hole through which movement is transmitted must have an airtight metallic packing; the rotating part must move easily and the current must cease to flow in one-twentieth of a second. Though exploders can produce sparks which can ignite firedamp, if methane is absent when the shot is fired, the shot will not liberate gas fast enough to be dangerous. Exploders are tested on the surface every other month by attempting to fire a fuse through a resistance. If the fuse fails to fire, the exploder is put aside for repair.

Undercuttings are not removed, so the coal does not readily part from the roof. The face therefore reveals any misfires, and the shot, if it fails, can be fired later, no crevices which may leak gas having been created. The Central Committee for French Collieries at Liévin believes that high voltage eliminates misfires, that long-time lag detonators are preferable to short and that copper acetylide in an electric fuse may be decomposed and become insensitive during preliminary heating if the current is insufficient.

In Great Britain, unused cartridges at some collieries are removed when canisters are refilled and the new ones placed below them, so that the older cartridges will be used first. When long cartridges are set end-on in the canister, this cannot be done, and the use of the cartridges in order of issuance cannot be assured. Primer cartridges usually are charged last, though with heavy charges, they may be put in the middle. The primer is frequently put in the hole detonator first so as to prevent striking or pulling out the detonator in tamping or the damaging of the leads. Low-tension detonators are used as more reliable than high-tension.

COMPRESSED air used to drive an auxiliary fan is thought to have caused an explosion of firedamp which killed 17 men at the Marchienne-au-Pont colliery in Belgium, February, 1932. Tests made since and recorded in the official *Annales des Mines de Belgique* show that compressed air under favoring conditions can ignite firedamp. A jet of compressed air at about 70 lb. per square inch, the usual pressure for the working place, with 0.3 lb. of sand was propelled into a rubber air hose which had a valve and pipe at the far end. The pipe was connected by a length of cable to a spark gap set in a globe containing firedamp. Allowing for the natural delay in methane ignition, the firedamp exploded immediately. With half that quantity of sand, there were sparks 0.08 to 0.12 in. long, but the firedamp did not ignite.

But when a fan connecting pipe was added to the equipment, ignition was obtained when only 0.1 lb. of sand was injected and only 42½-lb. air pressure was provided. When the quantity of sand was lowered to 0.06 lb. and the pressure raised to 70 lb., firedamp was not ignited.

When the pipe was passed through a hole into a metal covering, like a fan casing, and pipe and metal covering were given a few tenths of an inch of clearance all around the hole, the sand blast with 0.3 lb. of sand formed sparks between pipe and metal casing; such sparks as had ignited firedamp before but did not do so now, as none was present. Other investigators have found, says G. Raven, in this report, that coal, shale and rust will do likewise.

OVER 60 per cent of the carbon in most coals is found to be in the form of phenol, said Prof. H. E. Armstrong, addressing the Society of Chemical Industry of Great Britain. This, he said, had been determined by Professor Bone in tests of coal in which he used alkaline permanganate to ascertain the disposition of the oxidation products of the carbon in coal. The abundance of phenol, it might be added, has its bearing on the possibility of using coal as a plastic material, for phenol was one of the first and most important of the materials used for that purpose. Parenthetically, it may be added that, quoting Professor Armstrong, a crystalline material, honeystone, the aluminum salt of mellithic or benzenehexacarboxylic acid, a benzene carbon complex with six carboxyls hung about it, has been found in association with coal.

DOUBT has been thrown on the results of the float-and-sink test of some coals when made with carbon tetrachloride-toluene solution, because the latter became light brown in the process, and a quantity of dark brown substance was obtained by evaporation of the solvent. This material was deposited on the surface of the container in a glossy film, very brittle and easily scraped off in flakes. The deposit was especially evident with the coal of the Whitehaven district, which contains thin bands and lenticles of resin-like bodies clearly apparent to the naked eye, says R. L. Cawley, writing to the *Colliery Guardian*.

The resinous bodies in the Whitehaven coal are rapidly and completely

soluble in chloroform and carbon tetrachloride, one sample of such material containing 84.7 per cent carbon, 7.8 per cent hydrogen and 7.5 per cent oxygen. In passing, it may be said that coals of Utah contain large quantities of resinous bodies, and they may need careful consideration when float-and-sink tests are made with such coals. Dr. R. Lessing favors the use of carbon tetrachloride and petroleum ether in place of chloroform and alcohol, so as to mitigate the defects of the latter mixture.

W. Gooskov, Dniepropetrovsky Mining Institute, U.S.S.R., had stated, in a similar communication to the same publication, that it was necessary to wet coal before floating it in a calcium-chloride solution. Dr. Lessing agrees with Mr. Gooskov that free acid in a calcium-chloride solution will decompose carbonates in the coal, driving off carbon dioxides. Such acidity should first be corrected.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Requests for U. S. Bureau of Mines publications should be sent to Superintendent of Documents, Government Printing Office, Washington, D. C., accompanied by cash or money order; stamps and personal checks not accepted. Orders for other books and pamphlets reviewed in this department should be addressed to the individual publishers, as shown, whose name and address in each case is in the review notice.

Saving Life by Barricading in Mines and Tunnels at Times of Disaster, by D. Harrington and M. W. von Bernewitz. U. S. Bureau of Mines, Information Circular 6701, 5 pp.

By barricading themselves in after an explosion, 727 men have been brought out alive, though 117 have perished. The record is from 31 explosions since Nov. 13, 1909, inclusive, that being the date of the Cherry mine disaster. It includes disasters in coal, copper, lead, gold and silver mines and one rock passage, a Chicago sewer. The circular gives advice on the size of barricaded areas, the materials of construction and on the desirability of making provision for such rescue chambers.

* * *

Minerals Yearbook, 1932-33. U. S. Bureau of Mines, Washington, D. C. 820 pp. Price, $1.25.

Demand for speedier release of basic statistical information has led the Bureau of Mines to discontinue the more leisurely publication of the annual two-volume "Mineral Resources of the United States," as well as certain interim reports, and to make these data available in a new annual yearbook issued within the twelvemonth following the period covered by the figures presented, instead of two or three years later. The first volume in the new series, which covers 1932 data, includes 61 economical and statistical surveys by 59 members of the Bureau staff under the editorship of O. E. Kiessling, chief economist of the division of mineral statistics. F. G. Tryon and H. O. Rogers contribute the chapter on coal; coke and byproducts are handled by F. E. Berquist and H. L. Bennit; A. C. Fieldner discusses recent developments in coal utilization; W. H. Young and J. M. Corse review the situation in fuel briquets; Daniel Harrington closes the volume with a chapter on mine safety in 1932.

The greater part of the detailed statistical data formerly incorporated in the coal chapters in "Mineral Resources" is missing from the new publication. Presumably these data, which include statistics on county output, mine size and labor, will be made available through other channels of publication.

* * *

A Handbook of NRA. Federal Codes, Inc., New York City. 412 pp. Price, including supplements to end of year, $4.50.

Compiled under the direction of Lewis Mayers, associate professor of business law, College of the City of New York, this volume puts between the covers of one book much of the official pronouncements which have poured out of Washington since President Roosevelt asked Congress to enact NIRA. Part I of this work includes that message, the text of the law and various official and semi-official announcements dealing with its interpretation and administration. Part II, in addition to outlining the procedure for code submission, includes the text of the first fifteen codes approved by the President. Parts III and IV are concerned with the President's Reemployment Agreement (frequently and erroneously referred to as "the blanket code") and a summary of the modifications authorized for specific industries pending approval of codes filed by those industries. Part V is devoted to special regulations for the petroleum industry. Later material falling into these five classifications is carried forward in bi-weekly supplements known as the "NRA Reporter."

The book is wholly a compilation of material from official sources; no attempt has been made in either the original volume or in the supplements so far published to treat this material analytically, to draw any deductions from it or to present any evaluation—critical or otherwise—of the law or of its administration.

* * *

The International Conference on Mine Safety Research at Buxton, England, July, 1931, by George S. Rice. U. S. Bureau of Mines, Information Circular 6670, 19 pp.

After references to previous conferences and early cooperation between national mine research organizations, this circular continues with a description of the Buxton (England) 1931 meeting of mine testing station experts. With a party of 100 miners from a Nottingham (England) group of collieries, the conferees were given a coal-dust-explosion demonstration in the Buxton underground gallery, which, driven through shattered lime rock, is lined from end to end with steel arches and concrete. Though the tunnel is very wet, explosions are readily obtained.

Such demonstrations for miners are made every Sunday and are followed by an address, in this instance by H. M. Hudspeth, and by discussion. The gob-fire testing chamber at Buxton is described in the circular, also demonstrations of mining machines cutting into pyrite balls and quartzite sandstone and of hand picks striking on a particular type of sand rock causing methane ignitions, also of ignitions resulting from the adiabatic compression of gases.

This circular also describes British and German methods of studying roof movement and control. The conference discussed multiple shotfiring, a practice which only Great Britain and Belgium condemn, the latter only in part, but which the U. S. Bureau of Mines also has hitherto regarded with disfavor. All countries, led by France and Germany, are now beginning to favor simultaneous shooting. Belgium, in the person of A. Breyre, administrative director of the National Institute, declared simultaneous firing safer than firing by units.

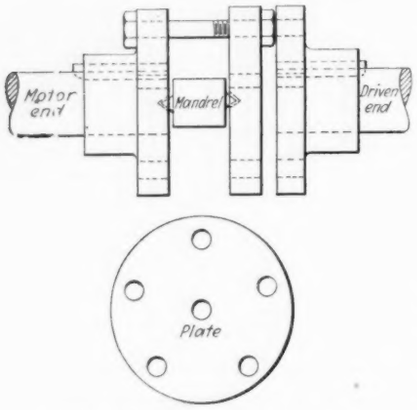
G. S. Rice described practice and experience in Utah, Colorado, Oklahoma and Alabama, where shots are fired in volleys from the surface, saying that danger rose from the high voltage used, defective wiring and uninsulated wires, prolonged current or reestablishment of current. Other discussions followed by A. Beyling on the igniting power of explosives and the ejection of hot particles by an explosive, also by A. Payman on the application of Schlieren photography to explosive research with a discussion on the means of determining the caking indexes of rock dust. The report contains a large number of most important items and is well worth reading.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

Puller for Removing Couplings Without Disturbing Motor

When motors are direct-connected to pumps and similar equipment, it is not always good policy to disturb the motor on the base when removing the armature or rotor, says John J. Nolan, Terre Haute, Ind., as it may be difficult to level up the motor again so that the couplings will line up as good as new. Where it is desired to



Puller for Removing Couplings

remove the armature or rotor without disturbing the motor, Mr. Nolan offers the puller shown in the accompanying illustration for removing the coupling.

In using this puller, the front end shield of the motor is first removed and the armature and rotor is pulled forward as far as possible to separate the two halves of the coupling and allow space for the puller and mandrel to be attached. If the space gained is not sufficient to accommodate one mandrel of sufficient length to pull the coupling all the way off on the first try, a second longer one can be inserted to complete the job. The centers on the mandrel end next to the plate are not absolutely necessary, but will serve to keep the mandrel in position and prevent it from interfering with the key when the nuts are being run down.

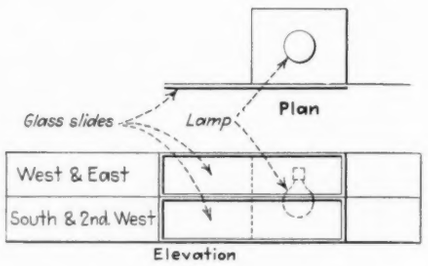
Mr. Nolan recommends that if it is desired to be prepared in advance for emergency removal of an armature or rotor that a plate be made of a templet to be secured by shutting down the equipment when the opportunity presents and removing enough of the coupling bolts to allow a piece of tin to be inserted between the halves of the coupling. The bolt holes may then be marked on the templets, which will serve to guide the drilling of the plate. In case it is desired to remove the half of the coupling on the driven end, it is necessary only to reverse the puller.

Glass Slides and One Lamp Make Fireboss Board

Boards on which the results of inspections by firebosses are marked up vary widely from mine to mine. The major variation usually is in the means employed to show whether or not the firebosses are "In" or "Out." Switching lights on or off in different compartments is a favorite method of showing this information. At the No. 4 mine of the Pond Creek Pocahontas Co., Bartley, W. Va., glass slides are employed, and one lamp burning continuously furnishes the illumination.

At this mine, one fireboss covers the "West" and "East" sections, while the

Showing the Slides on the Fireboss' Board at Bartley

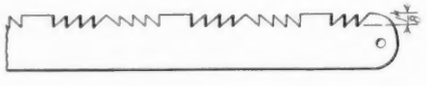


One Lamp Is Installed to Illuminate Both Slides

second covers the "South" and "Second West." One glass slide is installed on the board for each, and is moved to the right or the left to show whether the fireboss is inside or whether he has made his inspection and pronounced his territory "OK." When the accompanying photograph was made, both men had moved the slides to the left to bring the "OK" sections in front of the illuminated compartment.

Removing Dirt From Motors

Ray F. Good, Lykens, Pa., offers the following description of a method of removing dirt packed in the air gap between stators and rotors of motors. At Mr. Good's place of employment, a number of motors are installed in a pulverizing plant. General practice calls for blowing out motors every two weeks. At times, however, it has been found that dirt packs



Saw-Gage Construction

between the stator and rotor so that it is impossible in gaging to get the gage to go through. Inasmuch as instructions provide that bearings are to be changed when there is insufficient clearance to pass the gage, caution is necessary to determine whether the condition is due to actual wear or to the accumulation of dirt. This entails examination of the rotor to see if rubbing exists, and also if dirt is present.

The system followed by Mr. Good is based on gaging after the motors are blown out. If it is found that the gage does not clear easily and that there is dirt in the air gap, the latter is sawed loose and blown out by an air lance which is kept in operation during the process. The saw itself is made from a gage, as shown in the illustration. Originally, no particular system was followed in cutting the teeth, the form shown being evolved after an operation on an unusually stubborn case.

Ordinarily, the gage is only long enough to allow a 2-in. stroke, but by boring holes in each end, if not already present, a suitable handle or a piece of wire can be hooked in each. This makes possible a longer stroke, and with the available stroke the tooth form shown will cut away the dirt at any point between the ends of the rotor gap. The teeth are filed in the gage by clamping it against a strip of wood, one edge of which is planed and marked off with parallel lines $\frac{1}{8}$ in. apart, the edge of the gage projecting $\frac{1}{8}$ in. above the edge of the strip carrying the guide lines.

The time spent to make this device certainly is not longer than would be necessary to tear down a large motor, Mr. Good remarks, and where motors are operating in a dusty atmosphere, with dampness also present, it can be used quite a few times within the space of a month. Unless a very bad case is encountered, it takes about 15 minutes to remove the dirt from a motor with the aid of the air lance. This system is advantageous also where it is impossible to shut down the motor long enough to take it apart or to clean it by any other method. Using the saw gage, it is possible to do part of the job at any convenient time and then complete it in one or more additional steps when the opportunity for a short stoppage occurs.

In Emergency

When time is important, as it always is in emergencies, plenty of ideas, plus ingenuity in applying them, must be relied upon to cut delays in plant operation to a minimum or save lives and dollars. It is on these occasions that the material included in these pages month by month is most useful. One insignificant idea may turn out to be of great value. Consequently, keeping up with the latest developments should be a part of the program of every practical operating man. You can also do others a service by sending in ideas which you have developed. A sketch or photograph may make them clearer. Acceptable ideas are paid for at the rate of $5 or more each.

Sensitive Ground Recorder

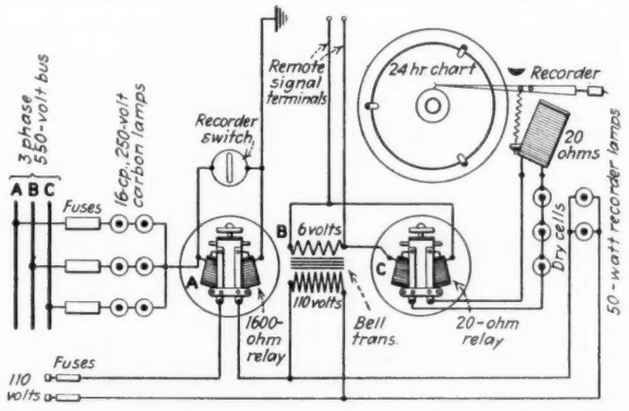
A new and sensitive type of ground detector and recorder to substitute for the lamp ground detector in a plant with a large number of motors is described by Ellis Mills, Toronto, Ontario, Canada, in a recent issue of *Power*. While the equipment described by Mr. Mills can be constructed by the average mechanic, it is sensitive enough to detect and record all current leakage on the system to which it is connected.

The detector uses 250-volt, 16-candle-power carbon lamps, two in series, star-connected, with a 1-amp. fuse in each line. With other line voltages, other combinations of lamps may be used. The star point is connected to a permanent ground through a sensitive relay, *A*, so connected that current leakage to the ground will flow through the coil. When this relay closes, an auxiliary 110-volt circuit is completed through its contacts. This in turn energizes a small bell transformer, *B*, and also lights the 50-watt bulbs in the recorder, which illuminate the chart.

The transformer secondary-circuit current operates a second relay, *C*, which closes the recorder circuit and energizes its coil, which in turn attracts the armature to which the arm of the recorder pen is connected. The pen is drawn across the chart, recording the time and duration of the current leak. Terminals are provided for a remote signal gong or pilot light to operate simultaneously with the recorder. The recorder switch is used to bridge the recorder when it is desired to use the detector only. Normally, the recorder does not measure the current leakage but records time and duration only. Provision is made for the insertion of a recording ammeter if it is desired to study the behavior of any particular effect.

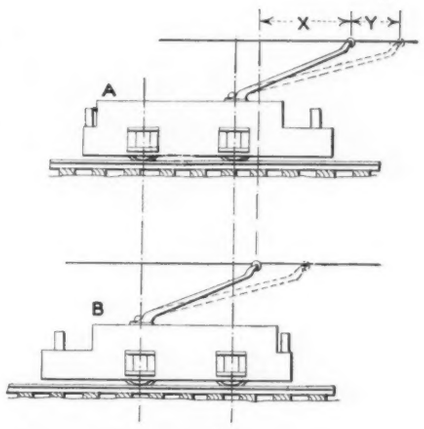
A portable detector on the same principle, but without the recording chart, was constructed to locate trouble on distribution lines. This detector is mounted in a hardwood box equipped with a carrying handle and 20 ft. of extension cord with insulated clips at the ends. Immediately upon the appearance of a ground upon the recorder, all feeders that can be dropped out without serious inconvenience are opened and reclosed. If the fault is not located on any of these, the more important feeders are opened at noon or at the end of the shift. When the faulty feeder is found, a man starts out with the portable detector and traces down the trouble by opening the sub-circuits while the portable is clipped on the line. In this way, the ground is quickly found, and the faulty equipment can be taken out of service and repaired.

Wiring Diagram for Ground Detector and Recorder



Spotting Trolley Frogs

While there are a number of variables to be taken into account when setting trolley frogs, there are certain guides which can be used, according to *O-B Haulage Ways*. Frog spotting, the publication observes, would be an easy matter if all locomotives were of the same type and if all trolley poles were of equal length and mounted and extending in the same direction. This, however, is not the case, with the result that a frog occasionally is shifted several times after installation to locate the point at which the wheel rides through properly with the minimum wear on the trolley wire.



Illustrating the Complications Encountered in Setting Trolley Frogs

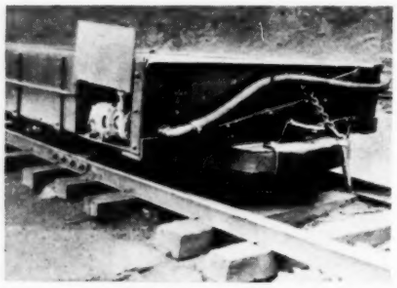
The accompanying illustration shows the two extremes which sometimes are encountered. With Locomotive *A*, the trolley

pole is mounted in the rear, while Locomotive *B* is turned around so that the mounting is in front. With the wheels of the two locomotives in the same position, as shown, the trolley wheel of Locomotive *A* is an appreciable distance, *X*, behind that of Locomotive *B*. Ordinarily, each locomotive would require a different frog setting. However, this is impossible when both are operated over the same track. In this case, the frog would be set to satisfy Locomotive *B*, with the result that the trolley wheel on Locomotive *A* would travel on the wire the additional distance *X*.

The illustration also shows the conditions arising out of the use of different lengths of trolley poles. It is quite evident that the pole on Locomotive *A*, shown by the dotted lines would require that the frog be set closer to the switch point than the pole shown by the solid lines. Such conditions naturally make it difficult to obtain the ideal frog setting, yet there is one general guide which will at least serve as a starting point. Measure the distance from the switch point to the center of the track frog, then set the trolley frog one-third of this distance in from the switch point. After a few trips, the proper position can be determined if the wheel is not riding properly.

Mine Car Plus Pump Makes Water Car

At the No. 4 mine of the Pond Creek Pocahontas Co., Bartley, W. Va., pumping equipment has been installed on a standard all-steel mine car to make a neat and compact water car for dewatering the few wet working places encountered. This car, in the opinion of the mine officials, is superior to pipe lines and gathering pumps, while a further advantage grows out of the fact

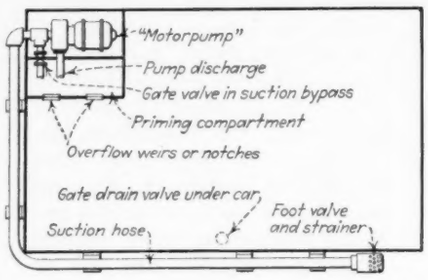


Water Car With Door Open to Show Pumping Unit

that the car trucks are standard and therefore do not require special repair parts.

The car used is of the end-gate type and was supplied by the American Car & Foundry Co. It is equipped with Timken roller bearings and stands 28 in. over the rail. Capacity level full is 100 cu.ft. The car was made watertight by electric-welding the seams and the openings around the end gate. A steel cover was applied in the same manner. Holes were cut at one corner to give access to the pumping equipment and priming valve, and steel partitions were installed to make separate compartments for the pump and pump discharge. The latter compartment holds water for priming the pump and is equipped with weirs over which the water flows into the main tank.

Pumping equipment consists of an Ingersoll-Rand "Motorpump." This is made up of a 50-g.p.m. pump direct-connected to a 275-volt direct-current motor. The pump



Arrangement of Equipment on Water Car at Bartley No. 4

is bolted to the motor housing. As the pumping head seldom exceeds a few feet, the unit is quite small. To prime the pump in starting up, the valve in the bypass from the suction line to the priming compartment is opened to supply the necessary water, and is closed as soon as the pump is in operation.

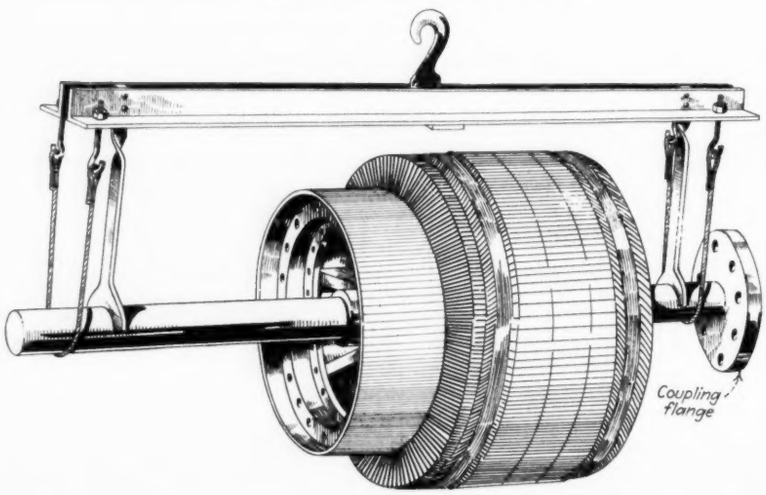
Special Lifting Device Left On Spare Armature

Handling large armatures with a lifting band may be unsafe, even if the armature with bearing and coupling are not of such a design as to make the use of a sling difficult, even though a spreader is employed. The accompanying sketch shows the type of lifting arrangement used on a 200-kw. motor-generator armature in the central repair shop of the Fordson Coal Co., Stone, Ky.

On this armature, the coupling flange is so close to the windings that there is not room for a manila rope sling; there is room, however, for a ½-in. wire rope. As but one armature of this type is kept on hand, the lifting arrangement is left in place for use in moving it quickly from the rack or floor to a truck. To prevent any possibility of the lifting bar striking the top of the armature and thus damaging the windings, forked straps are used to hold it away. The forks fit over the shaft ends. Threaded eyebolts are provided to tighten the ½-in. cables, thus holding the lifting device in a definite position.

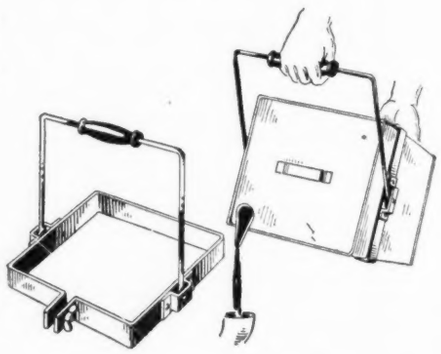
The bar consists of two 2½-in. angles set back to back, with the hook shank and forked straps inserted between them. The straps are securely riveted at right angles to the bar, but the hook can be slid to any desired position for balance.

Lifting Device in Place on Armature



Oil-Container Carrier

A square 5-gal. can is awkward to pour from with the small tin handle provided, and where these types of cans are in service, Charles H. Willey, Penacook, N. H., in a recent issue of *Power*, proposes the



Showing Construction and Application of Container Carrier

special carrier shown in the accompanying illustration. The band is formed to fit a standard square can and is equipped with a wing nut and screw for clamping it to the body of the can.

WORD from the FIELD

Coals Classified

Culminating six years of work by the technical committees of the Sectional Committee on Classification of Coals, sponsored by the American Society for Testing Materials and functioning under the procedure of the American Standards Association, tentative systems of classification of coals according to rank and according to quality and grade were presented at a committee meeting in Pittsburgh, Pa., Oct. 26. The ranks of coal were classified into four groups—anthracite, bituminous, subbituminous and lignite—and work was started on the classification of coal according to grades as determined by physical and chemical characteristics.

Retail Code Restricts Scrip

Two provisions forbidding the acceptance of scrip and restricting the extension of credit by company stores are included in the retail code, which was signed by the President on Oct. 23. The provisions, however, do not become effective until March 1, 1934, the interim to provide opportunity for an investigation into the "economic and social implications" of the provisions by a committee of three appointed by the NRA Administrator. Recommendations made by this committee will be placed before the President, and when approved by him shall replace the present code provisions, the text of which follows:

(a) No retailer shall accept as payment for merchandise any non-negotiable scrip, company checks, or other evidence of wage payment issued by any individual or private-profit organization in payment of wages or as an advance upon unearned wages. A negotiable instrument issued by any individual or private-profit organization in payment of wages shall be accepted only if it is payable in cash within one month of the date of issue. This paragraph shall not apply in cases where the cash funds of any individual or organization are rendered temporarily unavailable due to the closing by state or federal order of the bank in which such funds are deposited.

(b) No retailer shall extend credit in the form of goods, money or services to any person other than its own employees engaged exclusively in the retail trade, upon any employer's guarantee of part or all of said person's future wages, or pursuant to a wage deduction arrangement entered into with said employer, unless an identical guarantee or wage deduction arrangement is available to all retailers.

Retail Solid Fuel Code Filed

A revised code of fair competition for the retail solid fuel industry, covering all fuels not sold by liquid or metered measure, was filed with the NRA late last month by the National Retail Coal Merchants' Association, representing 55 per cent of the industry. Hearings on the code are set for Nov. 13, at the Department of Commerce Building, Washington, D. C. "Retailing" is defined as "selling, delivering, transporting, distributing and/or any one or more of these functions of solid fuel in other than carload or cargo lots." This definition, according to some observers, gives the retail industry full control over trucking from the mines.

Administrative provisions of the code provide for the establishment of a code authority, divisional code authorities and trade conferences or trade associations. Sale of solid fuel under a fair market price established by either a trade conference or trade association or a code authority is a violation of the code. The code also makes it a violation for a dealer to fail to require solid fuel to be reweighed at point of discharge from car to barge en route to the purchaser or to require that the seller bill for both the commodity and freight charges at the weight so determined, or to fail to require the shipper to make a just and reasonable water allowance when the fuel is loaded by water which passes into the car or where the washed solid fuel is loaded while wet.

December Double-Header

• Two new mining operations—one in the anthracite region and the other in the bituminous field—will be featured in the December issue of *Coal Age*.

• Products of 1933 planning and execution, the new Indian Head colliery of Indian Head Anthracite, Inc., and the new Farmington (Ill.) stripping operation of the Midland Electric Coal Corporation take places in the front rank of modern properties.

• With both underground and surface operations coordinated for maximum flexibility and a mechanical cleaning plant capable of handling 1,600 to 1,700 tons of raw feed per shift, Indian Head was designed with an eye to the future as well as maximum efficiency under present conditions.

• A plant capacity of 600 tons per hour, a 20-cu.yd. stripping shovel and mechanical cleaning facilities for all coal under 4 in. are among the high spots at Farmington, which, like Indian Head, has maximum flexibility and efficiency as immediate objectives, with future expansion taken into consideration in present layout.

Eavenson to Head A.I.M.E.

At the meeting of the board of directors of the American Institute of Mining and Metallurgical Engineers, held in New York City, Oct. 20, the following were nominated for office by the nominating committee and the nominations confirmed: president, H. N. Eavenson, Eavenson, Alford & Hicks, Pittsburgh, Pa.; vice-presidents, Karl Eilers, metallurgist, New York, and L. S. Gates, president, Phelps Dodge Corporation, New York; directors, William Wraith, vice-president, Inspiration Consolidated Copper Co., New York; Brent N. Rickard, manager, El Paso Smelting Works, El Paso, Texas; G. B. Waterhouse, professor of metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.; C. B. Murray, of Crowell & Murray, Inc., Cleveland, Ohio; and H. A. Buehler, state geologist, Rolla, Mo. Cadwallader Evans, Jr., general manager, Hudson Coal Co., Scranton, Pa., having resigned as director, E. T. Connor, mining engineer, of the same city, was elected to fill his unexpired term.

Iowa Association Organized

With the greater portion of the state's tonnage represented in its membership, the Iowa Coal Trade Association was organized early last month, with headquarters at Des Moines. Officers are: president, H. M. Poole, president, Norwood-White Coal Co., Des Moines; vice-presidents, W. R. Krapfel, president, Empire Fuel Co., Centerville; George Heaps, Jr., vice-president, Rex Fuel Co., Albia; J. H. Ramsay, general manager, Economy Coal Co., Des Moines; and K. G. Carney, vice-president, Scandia Coal Co., Des Moines; secretary, S. V. Carpenter, secretary, Sunshine Coal Co., Centerville; treasurer, M. G. Youngquist.

Associations

W. J. Jenkins, president, Consolidated Coal Co. of St. Louis, was again chosen president of the Illinois Coal Operators' Association at the annual meeting held in Chicago, Oct. 31. Other officers also were reelected, as follows: secretary, Fred S. Wilkey; treasurer, O. M. Gordon, treasurer, Bell & Zoller Coal & Mining Co.

L. E. Woods, president, Crystal Block Mining Co., Huntington, W. Va., was reelected president of the Operators' Association of the Williamson Field at the annual meeting last month. Other officers were chosen as follows: vice-president, C. A. Hamill, general manager, Sycamore Coal Co., Cinderella, W. Va.; treasurer, J. D. McLaughlin, general manager, Earlston Coal Co., Kermit. W. Va.; secretary, Joseph J. Ardigo, Williamson, W. Va.

Anthracite Code of Fair Competition Submitted to NRA on Oct. 30

A code of fair competition for the Pennsylvania anthracite industry was filed with the NRA by operators representing 75 per cent of the production on Oct. 30. The Anthracite Institute is designated as the recipient of reports and data necessary for the enforcement of the provisions of the code, and limitations on sales outlets are set up. The proposed code also establishes a system for controlling prices and terms of sale based on publication, sets up sizing standards, and provides for administration by a committee of operators. Hearings are scheduled to start Nov. 17.

In addition to J. B. Warriner, Lehigh Navigation Coal Co.; F. W. Leamy, Hudson Coal Co.; James Prendergast, Susquehanna Collieries Co. and the Lytle Coal Co.; Brice P. Disque, Pittston Co.; and W. W. Inglis, Glen Alden Coal Co., the letter of transmittal was signed by Donald Markle and A. B. Jessup, Jeddo-Highland Coal Co.; Charles Dorrance, Penn Anthracite Mining Co.; and E. H. Suender, Madeira, Hill & Co., as representatives of the following:

Alden, Ames, Barry, Buck Run, East Boston, George F. Lee, Hazle Brook, Humbert, Jeddo-Highland, Kehoe-Berge, Kingston, Lynott, Meadowside, Mt. Laurel, Nanticoke Valley, New Upper Lehigh, Pompey, Price-Pancoast, Racket Brook, Repplier, St. Clair, Scranton, Spencer, Stevens, Suffolk, Troy, Westbrook and West End coal companies; Anthracite Mechanical, Haddock, Northumberland and Penn Anthracite mining companies; Wolf and Wyoming Valley collieries companies; Buck Mountain and Miners Mills coal mining companies; A. E. Dick and Scranton contracting companies; Hillman Colliery Co.; Indian Head Anthracite, Inc., and the Sherman Coal Corporation; Lackawanna Valley Fuel Co.; Beardslee & Lewis; Coxe Bros. & Co.; R. M. Cranston; Madeira, Hill & Co.; Pardee Bros. & Co., Inc.; and Weston Dodson & Co., Inc.

Among the companies not represented in the list of sponsors were the Philadelphia & Reading Coal & Iron Co. and the Lehigh Valley Coal Co. The text of the code follows:

Art. I—Definitions

Sec. 1. The term "industry" means the business of producing and marketing anthracite, by an operator from the anthracite fields of Pennsylvania.

Sec. 2. The term "operator" means any person, firm, association, trust or corporation engaged in production in the industry.

Sec. 3. The term "distributor" means any person, firm, association, trust or corporation owned or controlled by an operator, or so affiliated with an operator as to be classed as the operator's distributor, and who sells or resells anthracite to retailers, wholesalers, wholesale consumers or at retail in the retail area in which the mine is located.

Sec. 4. The term "wholesaler" means any person, firm, association, trust or corporation, other than an operator or distributor, engaged in selling anthracite in carload or cargo lots to retailers, other wholesalers or wholesale consumers. Provided that with the exception of dock operators, no seller shall be classed as a wholesaler who rehandles anthracite.

Sec. 5. The term "Institute" means the Anthracite Institute, a trade association of anthracite operators.

Sec. 6. The term "committee" means a committee of operators constituted and appointed as provided in Art. X hereof.

Sec. 7. The term "act" means the National Industrial Recovery Act.

Sec. 8. The term "President" means the President of the United States of America or any one authorized by him to act under the National Recovery Act.

Art. II.

This code is adopted pursuant to Title I of the act, to effectuate the policy thereof in so far as it is applicable to the industry.

Art. III—Conditions of Employment Required by NRA.

Sec. 1. As required under Sec. 7 (a) of the act, the following provisions are conditions of this code:

(1) That employees shall have the right to organize and bargain collectively through representatives of their own choosing, and shall be free from the interference, restraint or coercion of employers of labor, or their agents, in the designation of such representatives or in self-organization, or in other concerted activities for the purpose of collective bargaining or other mutual aid or protection.

(2) That no employee and no one seeking employment shall be required as a condition of employment to join any company union or to refrain from joining, organizing or assisting a labor organization of his own choosing.

(3) That employers shall comply with the maximum hours of labor, minimum rates of pay and other conditions of employment approved or prescribed by the President.

Art. IV—Hours of Labor, Rates of Pay and Other Conditions of Employment

Sec. 1. Nothing contained in this code or the voluntary submission thereof shall be deemed or construed to change, waive or prejudice the rights or obligations of any of the parties created by or arising out of the collective bargaining contract (which contract covers hours of labor, rates of pay and conditions of employment) between operators and Districts 1, 7 and 9, United Mine Workers of America, dated Aug. 8, 1930, and expiring April 1, 1936, anything herein to the contrary notwithstanding.

Sec. 2. The maximum hours of labor and minimum rates of pay of employees, other than those covered by Sec. 1 hereof, shall be as follows:

(a) No employee shall be employed more than 48 hours per week, averaged over a five-week period, except executive, supervisory, sales and engineering forces, watchmen or patrolmen; skilled office employees receiving $35 per week or more; repair crews on emergency work, or other workers whose employment for a short period before and/or after standard hours of operation is customary and necessary in the normal operation of the mines.

(b) Employees working on a weekly or monthly basis shall be paid at a rate not less than $15 per week in cities over 500,000 population; not less than $14.50 per week in cities between 250,000 and 500,000 population; not less than $14 per week in any city between 2,500 and 250,000 population; not less than $12 per week in any town with less than 2,500 population.

(c) Employees working on an hourly basis shall be paid not less than 40c. per hour.

Sec. 3. No person under sixteen (16) years of age shall be employed.

Art. V—Reports and Statistics

Sec. 1. Each operator shall furnish the Institute with such information concerning production, shipments, sales, distribution, realization, unfilled orders, anthracite in storage, hours of labor, rates of pay and other conditions of employment as the President may request and/or as the committee shall deem necessary or proper to effectuate the purpose of the code and the policy of Title I of the act.

Sec. 2. All such information and reports furnished by any operator shall be certified and sworn to as and when required by the committee.

Sec. 3. To the extent that the committee may deem any information to be furnished in accordance with the provisions of the code to be of a confidential character, and that the disclosure thereof in detail is not essential in order to effectuate the policy of Title I of the act, such information shall be submitted only to a disinterested person or persons designated by the committee; and no disclosure thereof shall be made except in consolidated form reflecting the condition of the industry as a whole, without separately disclosing the information from any operator.

Sec. 4. Adjustments of claims with purchasers, made after the effective date of this code, showing tonnage involved, amount allowed and reasons therefor, shall be reported monthly in writing to the Institute.

Art. VI—Trade Relations

Sec. 1. Sales of anthracite by operators shall be confined to the following:

(a) To distributors or wholesalers, for resale to retailers, wholesale consumers or other wholesalers.

(b) To wholesale consumers for their own use and not for resale, when delivery is by car or boat, and not for use in residential buildings commonly served by the retailer.

(c) To wholesale yards for resale to retailers.

(d) To retailers having appropriate handling, storage and delivery facilities.

(e) To purchasers served from the facilities of the operator, where consumption is to be in the retail trade area in which the mine is located.

Provided, however, that should any question arise as to the interpretation of this article, or the reasonableness of its application in any particular case, the same shall be referred to the committee, which shall have the power to interpret the provisions thereof and grant exemptions therefrom.

Sec. 2. No sales shall be made by any operator to any distributor or wholesaler who fails to accept or comply with the provisions of Arts. VI, VII and IX hereof, or who fails to furnish information of the character required by Art. V hereof.

Art. VII—Prices and Terms of Sale

Sec. 1. Sales prices, terms and sales policies shall be filed with the Institute by each operator and shall govern transactions between such operator and the purchaser of his product until revised prices, terms and sales policies shall be so filed. The effective date of each revision shall be not earlier than ten days after the date of such filing. The filed prices, terms and sales policies shall not necessarily apply to sales of sizes smaller than rice; nor to sales of other sizes under contracts with wholesale consumers for industrial use and not for resale; nor to sales under contracts made either directly or through retailers or wholesalers with institutions or governmental agencies; provided that the tonnages, prices and terms of all such sales shall be filed with the Institute within ten days after making said sales or contracts; and provided, further, that in the case of sales made to institutions or governmental agencies through retailers or wholesalers, the names of said institutions or agencies shall also be filed with the Institute.

Sec. 2. Filed sales policies shall include such policies as involve concessions or subsidies to the purchaser or assist the purchaser in meeting expenses normally attaching to the conduct of his business.

Sec. 3. Filed prices and terms shall be inclusive of commissions paid to distributors or wholesalers, and the prices and terms of resale by said distributors or wholesalers to retailers or wholesale consumers, in respect to the product of any operator, shall result in a net price to the purchaser, f.o.b. mines, which shall not be lower than if the sale had been made directly by the operator in conformity with his filed prices and terms.

Sec. 4. Filed prices and terms at operator-owned or operator-controlled wholesale yards shall be inclusive of mine prices, transportation costs and yard margins.

Sec. 5. Bona fide contracts antedating the effective date of this code, when in contravention of filed terms, prices and sales policies, shall be filed with the Institute within ten days after the effective date of the code, showing date, terms, tonnage and duration of said contract, together with the location of the buyer.

Sec. 6. The prices, terms of sale and sales policies filed pursuant to this article shall be open to the inspection of all operators or their representatives during business hours at the offices of the Institute.

Sec. 7. The committee shall have the power on its own initiative or on the complaint of any operator, to investigate all facts and circumstances pertinent to the prices, terms or sales policies filed by any operator with the Institute, and, for the purpose of the investigation, to require said operator to furnish such information as the committee shall deem necessary or proper. If the committee, after such investigation, shall determine that any such filed prices, terms or sales policies constitute evasions or violations of any of the provisions of this code, or tend to defeat the purposes

of the act and may result in unfair competition, the committee shall require said operator to file revised prices, terms and sales policies, in whole or in part; and if said operator shall not file such revision within ten days after such notice of determination, the committee is authorized, in behalf of said operator, to file a revision of the objectionable items with the same force and effect as if said revision had been filed by said operator, provided, always, that any prices, terms and/or sales policies filed by the committee shall be subject to the approval of the President before the operator affected shall be governed thereby.

ART. VIII—STANDARDS OF SIZING AND QUALITY

Sec. 1. Every operator in the preparation and shipment of anthracite shall observe standards of sizing established by the Institute as of April 1, 1931, or as hereafter modified by the committee, and shall maintain standards of quality which shall in no way be inferior to those established by the Institute as of that date. No operator shall be prevented from making and selling a new size, provided it is sold under definite specifications, a complete description of which has been filed with the Institute.

Sec. 2. If any operator shall advise the committee that it is impracticable to prepare anthracite at a colliery or washery to the standards contemplated in Sec. 1 above, because of special conditions or physical characteristics of the product, and the committee upon review shall so find, the committee, for the protection of the consumer, shall prescribe a special trade description for such anthracite under which it must thereafter be sold, either to wholesaler, retailer or consumer.

ART. IX—UNFAIR PRACTICES

The following practices are hereby declared to be violations of the code:

Sec. 1. Contracting with retailers or wholesalers for future delivery at prices and terms other than the filed prices and terms effective at time of shipment, f.o.b. mines or tidewater ports, except to cover contracts made by a wholesaler or a retailer either with wholesale consumers for industrial use or with institutions and/or governmental agencies.

Sec. 2. Consigning unordered anthracite to the yard of a retailer.

Sec. 3. Selling to or through any broker, jobber, commission agent or sales agency which is in fact an agent for one or more retailers or wholesale consumers, except in accordance with filed prices, terms and sales policies applicable to retailers and wholesale consumers.

Sec. 4. Prepaying freight charges other than to tidewater and/or lake ports with the intention or effect of granting discriminatory credit allowances.

Sec. 5. Allowing to purchasers of anthracite commissions, bonuses, rebates, refunds, gratuities, unearned discounts, premiums, privileges or subsidies of any kind, whether in the form of money, services, advertising, or otherwise, except in accordance with filed sales policies.

Sec. 6. Giving, or permitting to be given, to agents, employees or representatives of customers or possible customers anything of value as an inducement to cause their employers or principals to purchase anthracite, or to refrain from dealing with competitors.

Sec. 7. Misrepresenting the size or quality of anthracite, in contravention of the provisions of Art. VIII hereof.

ART. X—ADMINISTRATION

Sec. 1. The code shall be administered and interpreted by a committee of operators, in which any one operator or any single group of operators with a commercial production of 2,500,000 tons or more in the year 1932, as ascertained from reports of the Pennsylvania Department of Mines, shall be entitled to one representative.

Sec. 2. Notices shall be given to all operators of all meetings of the committee, and where a proposed amendment to the code is to be considered such notice shall contain the substance thereof. Any operator may appear before the committee in person to present his views on any question, or to cast his tonnage vote thereon. The committee shall also give written notice to all operators from time to time of any amendments adopted, interpretation made or decisions rendered, as they may affect the administration of the code.

Sec. 3. The committee is empowered to interpret and administer the provisions of the code and secure adherence thereto, to hear and adjust complaints and proposals for amendments thereto, to prescribe such rules and regulations as may be appropriate for the administration and enforcement thereof, and otherwise carry out within the industry the purposes of the act.

Sec. 4. Committee members representing a majority of the tonnage of the industry shall constitute a quorum and the committee shall act by a majority vote of the members present, except in cases where a tonnage vote is requested, when a two-thirds vote of the tonnage voting shall control.

Sec. 5. Any operator or any group of operators represented on the committee, as provided in Sec. 1 hereof, shall have the power to appoint alternates, substitutes or successors.

Sec. 6. The expense of administering this code shall be borne by those subject to the code, each paying his proportionate share as assessed, computed on a tonnage basis, in accordance with the regulations prescribed by the committee.

ART. XI—MODIFICATIONS AND AMENDMENTS

Sec. 1. This code and all the provisions thereof are expressly made subject to the right of the President, in accordance with provisions of Clause 10 (b) of the act, from time to time, to cancel or modify any order, approval, license, rule or regulation issued under Title I of said act.

Sec. 2. The committee may submit amendments to the President for approval, and said amendments when so approved shall have the same force and effect as if originally a part hereof.

ART. XII—EFFECTIVE DATE

This code shall take effect on the second Monday following its approval by the President, and (subject to the right of the President under Sec. 1 of Art. XI hereof) shall continue in effect until April 1, 1934.

After April 1, 1934, no operator shall be deemed to consent to the further operation of this code or to waive any of his rights to object to its further application to him, provided he shall have served 30 days' written notice on the President to that effect.

Pennsylvania-Illinois Controversies Continue; Labor Trouble Slight in Other Fields

Except for the continuation of long-standing controversies between insurgents and the United Mine Workers in Illinois and between union sympathizers and steel companies operating captive mines in western Pennsylvania, the first month of operation under the bituminous code went by with relatively little labor trouble, comparatively speaking, and was signalized by the adoption of a number of additional wage agreements for various districts throughout the country.

Eastern Ohio went under the union banner by signing a district wage agreement on Oct. 6 carrying the basic rates of $4.60 inside and $3.60 outside prescribed in the bituminous code and the Appalachian wage agreement which went into effect Oct. 2 (see pp. 350-353 and 356-358, October *Coal Age*). Southern Ohio miners and operators, already working under a union agreement, signed a revision Oct. 20 to bring the rates up to those prescribed in the code and Appalachian agreement. Under the terms of the revision, retroactive to Oct. 2, the former basic day rate of $3.87 (increased from $3.28 in August) was raised to $4.60, while the loading scale was increased from 42c. (38c. prior to Aug. 16) to 52c. and the machine-cutting scale from 7c. (increased from 6c. in August) to 9c.

Table I—Wage Rates Established in the Appanoose and Wayne County (Iowa) Agreement

Tonnage Scale	Per Ton
Screened and hand-picked coal	$1.30
Machine mining:	
Runners, helpers and shovelers	0.07
Loaders	0.82
Yardage Scale	
Entries, 8 ft. wide, per yd.	1.79
12 ft. wide, per yd.	1.39
14 ft. wide, per yd.	1.35
Room-turning, 12-14-ft. neck	2.33
Corner-cutting, longwall, per yd.	0.65
Brushing, per yd.	0.55
Crib-building, each	0.65
Inside Day Scale	Per Day
Motormen	4.85
Tracklayers	4.70
Pipemen	4.62
Drivers, tripriders, cagers	4.56
Couplers, boys	3.35
Oilers and trappers	3.00
Pushers and other adult labor	4.45
Machine runners	5.11
Helpers and shovelers	4.85
Outside Day Scale	
Engineers, 9 hours	5.36
Blacksmiths and machinists	4.70
Spraggers and couplers	3.35
Slate pickers and oilers, boys	3.00
Common outside labor and tail-rope engineers	3.86

Wayne and Appanoose County (Iowa) mines began operations under a new wage agreement Oct. 3. The basic scale, in conformity with the coal code, is $4.56 for skilled inside labor. Other day, tonnage and yardage rates are shown in Table I. The Northern Colorado Coal Operators' Association, operating in District L of the coal code, entered into a wage agreement with District 15 of the United Mine Workers early in September. The agreement provides, it is reported, for a basic wage scale of $5.25 per day for inside labor, 25c. above the rate of $5 fixed in the coal code. The basic outside rate is reported as $4.25, against $3.75 in the code. Tonnage and yardage rates were advanced to conform with the long-standing agreement between the union and the Rocky Mount Fuel Co. Late in October it was reported that an agreement covering southern Colorado and New Mexico had been reached providing for a basic inside day rate of $4.70, against the scales of $4.44 and $4.48 included in the code.

After three weeks of inconclusive negotiations over the captive-mine controversy in western Pennsylvania, the President again took a hand by calling a conference of representatives of the steel companies, the United Mine Workers and the NRA at the White House Oct. 30. At the previous meeting, on Oct. 7, the President urged that both sides enter into negotiations to settle the disputed points—primarily the check-off and the election of checkweighmen—and declared that in event such collective bargaining failed he would pass on the questions involved, using the principle that "captive mines must operate under conditions of work substantially the same as those which obtain in commercial mines."

As a result of the Oct. 7 conference, Philip Murray, vice-president, United Mine Workers, and Thomas Moses, president of the H. C. Frick Coke Co., commenced a series of conversations in Pittsburgh on Oct. 10, which apparently came to an inconclusive end on Oct. 18, when Murray announced that he con-

sidered the negotiations closed. Moses, however, stated that the discussions had not been ended by him. In the meantime, the President, on Oct. 12, released a letter signed by representatives of twenty steel companies operating captive mines in Appalachian territory and Alabama expressing their willingness to "recognize voluntary orders for payment of any portion of the wages of any employee of our coal mines for dues to any organization of which he may be a member to the extent that we are legally permitted to do so under the laws of the respective states in which our operations are conducted, on the understanding that all of our employees shall be free to join or not to join any union as they please, and that any of our employees who do not wish to join a union will in some effective way be assured of adequate protection from interference, restraint or coercion of any kind."

Neither the President's proposals nor the subsequent negotiations were successful in reopening the captive mines in western Pennsylvania, though, with the help of a ban on roving pickets by Governor Pinchot, the majority of the commercial mines in all but the Connellsville district were able to reopen beginning Oct. 16. Commercial mines in the Connellsville field were not able to start up until late in the month, however, and then only on a limited scale, while the miners kept captive operations closed tight. The latter condition, together with the failure of negotiations and charges by the United Mine Workers that the steel companies had broken faith, thus promoting disorders, resulted in the President's intercession.

As a result of the Oct. 30 conference, the President announced that the check-off had been conceded and that a formal agreement at least as favorable as the Appalachian agreement would be made between captive-mine operators and representatives of the miners, the latter to be chosen under the direction of the National Labor Board of the NRA. These representatives may or may not be members of a labor organization.

With the National Guard enforcing a truce in Illinois after the night-long armed attack on the No. 43 mine of the Peabody Coal Co., Harrisburg, Oct. 4-5, during which hundreds of shots were fired by insurgent sympathizers, the NRA, in the person of Donald Richberg, general counsel, moved to end the strife between the United Mine Workers and the Progressive Miners of America. As a result of a general conference at Springfield, Oct. 5, in which Mr. Richberg, Governor Horner and representatives of both miners' factions and both operators' groups participated, the NRA, on Oct. 19, released a plan of settlement based on Mr. Richberg's findings.

In his report, Mr. Richberg declared that there is a distinction "between the legal right of employees to select their own representatives and to bargain collectively with their employer, and the mistaken claim that the law compels an employer to make a particular contract or to employ any particular man. It is this misunderstanding of the law which is increasing the difficulty of bringing about a peaceful settlement of the Illinois controversy." Sec. 7(a) of the NIRA, which is included in the bituminous code, gives employees at any mine the right to select their representatives and bargain collectively with their employer, but "when such collective bargain has been made and is in effect, the contract should be respected and any mine operated under such a contract should be free from interference of aggressive, intimidating action by those who do not represent the men employed in that mine."

Citing the attack on Peabody No. 43 mine, Mr. Richberg declared that such incidents "mean either that the leaders of these miners have no control over their followers or that they are promoting armed violence to accomplish their aims," and expressed the opinion that those willing to avoid a continuance of a "reign of terror" should accept the following proposals as a basis for a permanent settlement:

1. All the law-abiding organizations of the miners of Illinois shall immediately agree that all mines will be permitted to operate peacefully under their existing contracts with their present employees, without any organized interference with operations, or intimidation of employees by those not now employed in said mines.
2. Each mine operator shall be free to employ additional miners who are willing to work under the terms of existing contracts; and shall agree to give preference in reemployment to the applications of local miners who were formerly employed in his mine.
3. All peaceful means of self-organization of the miners and discussion of the merits of rival organizations shall be available, but all use of force or coercion shall be prohibited and any person or organization resorting to such methods shall not be entitled to receive the benefits of this agreement or the aid of the government. If any dispute over right of representation or any other matter cannot be adjusted through the means provided in contracts between employers and employees, or through the means provided in the Bituminous Coal Code, any operator or miners' organization may submit it to the National Labor Board, at Washington, for impartial adjudication and determination of the rights of the parties, in accordance with the requirements of the law and justice.

This plan was presented to both operators and miners by Governor Horner at a meeting on Oct. 19. On the same day, the Progressives staged a massed march on Springfield, during the course of which one insurgent adherent was killed on the street. Progressive representatives received the settlement plan with little enthusiasm, and filed counter proposals reiterating their claim to control in Illinois, which were rejected by the NRA on Oct. 26. Late in the month, the Peabody Coal Co. announced that it would give jobs at its Nos. 43 and 47 mines to insurgents who would return to the United Mine Workers, explaining in justification of this proposal that it must live up to its contract with the regular union.

A controversy between union men and miners at cooperative mines resulted in the establishment of military rule in Sullivan County, Indiana, on Oct. 9. Two National Guard companies took over the county after several bombings and a gun battle between mine guards and pickets at the Starburn cooperative north of Sullivan. As a result of this move, 2,000 union miners went on strike in the Linton district on Oct. 10 to force employment of organization men throughout the district, and a mass meeting to protest the calling out of the troops was held at Clinton. A third National Guard company moved into Sullivan County on Oct. 12 as a result of renewed bombings and disorders, and on the same day three of the largest locals in the county voted to return to work. Quieter conditions returned a few days later, with the result that all but one of the guard troops were withdrawn on Oct. 23, leaving only a provisional company in camp in the county.

October also brought about a tilt between the National Labor Board and operators in Hopkins, Webster and Christian counties, in western Kentucky, over the question of recognition of the United Mine Workers. As a result of an investigation in August into the method employed to promote the Independent Miners' Union, alleged to be a company union, the board decided to call up the Operators' Association of West Kentucky, the presidents of the independent organization and District 23, United Mine Workers, and representatives of the Hart, Dawson Daylight, Reinecke, West Kentucky, Blue Valley, Buchanan, Kentucky Derby, Harmon Creek and Norton coal companies for a hearing on Oct. 12.

C. F. Richardson, president, West Kentucky Coal Co., was the only operator to appear, and as a result, Senator Wagner, chairman of the board, declared that the missing representatives would "be required to appear." No further action was taken during September, though Mr. Richardson later expressed his willingness to allow the board to poll the West Kentucky employees to determine whether they would prefer to join the United Mine Workers or remain in their present labor organization, the Employees' Mutual Benefit Association. Also, the Dawson Daylight Coal Co., declaring that it had no labor trouble or any dispute to submit to the board, and that it had no intention of declining the request to appear, expressed its willingness to discuss the situation with board members at a future date. The labor board announced on Nov. 1 that the western Kentucky question would be referred to the appropriate regional labor board when established.

In Muhlenberg and Ohio counties, also in western Kentucky, negotiations between operators and the United Mine

Soft Coal Tonnage Up

Bituminous coal production rose to 29,656,000 net tons in October, according to preliminary figures compiled by the U. S. Bureau of Mines. Production in September was 29,500,000 tons and the output in October, 1932, was 32,677,000 tons. Anthracite production dropped to 4,711,000 tons in October, against 4,993,000 tons in September and 5,234,000 tons in October, 1932.

Total production of bituminous coal in the first nine months of this year was 267,758,000 tons, an increase of 23,833,000 tons, or 9.8 per cent, over the total of 243,925,000 tons in the same period in 1932. Anthracite output in the first nine months was 40,164,000 tons, an increase of 174,000 tons over the total of 39,990,000 tons in the corresponding months of last year.

Workers were reported to be proceeding satisfactorily in late October.

Ten Alabama mines employing 2,000 men were affected in October by a strike over union recognition, the check-off and employment of checkweighmen. Through the efforts of the National Labor Board, the stoppage was brought to an end about the middle of the month by the establishment of collective bargaining arrangements and the consummation of an agreement that future problems would be settled by negotiations between operators and District 20 of the United Mine Workers.

Southern Tennessee mines were closed in October by a strike over the check-off, which was settled on Oct. 25 by the adoption of a wage agreement embodying this feature.

While some unrest over the scheme of districting provided in the coal code for Colorado was in evidence early in October, there was little actual trouble in the northern fields. Much of the dissatisfaction hinged on the inclusion of certain northern fields in the lower wage bracket applied to all territory outside of Code District L. In the Aguilar district in the Trinidad field of southern Colorado, the Brodhead mine of the Temple Fuel Co. and the Kenneth mine of the Vickers Coal Co. were tied up early in the month by union sympathizers over the question of hiring actual employees and checkweighmen and the employment of additional men in some classes of work.

Another feature of developments in Colorado during the month was an announcement on Oct. 31 that the Colorado Fuel & Iron Co. would abandon its twenty-year-old employee-representation plan, known as the "Rockefeller plan," and recognize the United Mine Workers. This action was taken following a poll of employees, and is subject to the approval of the federal district court, the company being in receivership.

In New Mexico, the Phelps Dodge Corporation announced on Oct. 26 that the Dawson operations would be closed down indefinitely. The miners went on strike Oct. 3, and in subsequent negotiations an agreement was reached on all disputed points, except that the company refused to sign with the United Mine Workers. As a result, the miners voted late in the month to continue the stoppage, and the company announced the closing plan.

In a month featured by a continuation of the bombings and attacks on members of the United Mine Workers that have characterized the development of the insurgent movement in the northern anthracite field, the Anthracite Miners of Pennsylvania extend their drive for power from the operations of the Hudson Coal Co. and the Penn Anthracite Mining Co. to those of the Glen Alden Coal Co.

The insurgents called a general strike at Glen Alden properties on Oct. 18, meeting with only partial success in spite of widespread attempts to force out the working members of the United Mine Workers. On Oct. 25, business men from Wilkes-Barre, Pittston and Scranton went to Washington to request the National Labor Board to intervene, and the rival factions each appealed to Governor Pinchot for protection. Thomas Maloney, president of the insurgents in District 1, on Oct. 26, called for a general meeting of all locals to consider ending the strike. This meeting took place in Wilkes-Barre on Oct. 30 and after a number of inconclusive attempts to secure the definite intervention of the National Labor Board the delegates voted a general strike for Nov. 6. Approximately 25,000 men were reported to have responded.

Welding Demonstration Features Institute Meeting

A practical demonstration of new gas welding and cutting methods as applied to coal mining work featured the monthly meeting of the New River & Winding Gulf Electrical and Mechanical Institute, at Mt. Hope, W. Va., Oct. 21. The welding demonstration, under the direction of representatives of the Linde Air Products Co., took place at the central shops of the New River Co., Macdonald, with C. R. Heermans, foreman, supplying the equipment to be repaired, and E. J. W. Egger, development engineer, Pittsburgh, Pa., explaining the processes. Mr. Egger also presented a paper on welding at the technical session following the dinner in the evening.

Included in the welding demonstration was a new method of applying Haynes Stellite to machine bits. The point was first ground back approximately $\frac{3}{16}$ in., leaving a flat surface perpendicular to the bit axis. Stellite was then welded to this surface and the ball of hard material dressed slightly on an emery wheel. In case extremely hard cutting or sulphur balls which might cause breakage of the bits back of the weld are likely to be encountered, it was recommended that the bits be heated after the application of Stellite to normalize the structure.

A second feature of the demonstration was the bronze-welding of a tooth into a broken chain sprocket to show how this could be done so accurately as to require but little dressing with a file. Temperatures are so low with bronze-welding that preheating of either cast iron or steel is not necessary if only a few teeth are to be replaced, it was declared.

Considerable interest was displayed in the use of the oxygen lance for piercing plates too thick (over 3 in., approximately) for the ordinary cutting torch. In this work, a $\frac{3}{4}$-in. steel pipe is used as a torch, and either the work or the torch is first heated with a blowpipe, after which oxygen is blown through the pipe. The pipe then begins to burn and supplies the heat for cutting. With this torch, it was pointed out, axles can quickly be removed from wheel hubs where a press is not available, and the same applies to removing a broken pin from a crank disk.

"Hand-Linde" welding of heavy steel pipe was another item in the demonstration. High speed in either field or shop can be attained, it was shown, by reducing the size of the Vee from 90 to 70 deg. and using a carbonizing flame with an excess of acetylene. Galvanized pipe also was welded to show the decreased possibility of corrosion.

Flame machining also was demonstrated to show how it speeds up the truing of locomotive tires or wheels in a lathe. Much of the time in truing a tire is required for removing the false flange, and it was pointed out that this could be done in 5 or 10 minutes by flame-machining, the lathe being used to complete the truing. The final item in the afternoon program was the use of the "Secator," or portable, motor-driven cutting machine in making straight or curved cuts in $\frac{1}{2}$-in. steel plate.

The evening session was prefaced by a dinner, with Edgar Graff, safety inspector, New River Co., as toastmaster. M. K. Clay, chief electrician, Raleigh Coal & Coke Co., and president of the institute, presided over the technical session. After the presentation of Mr. Egger's paper, Prof. A. A. Hall, head of the department of electrical engineering, West Virginia University, Morgantown, W. Va., took up the question of "practical electricity," using the rental of horses or "horsepower" from a livery stable to explain away the mystery of kilowatts, kilowatt-hours and complicated rate schedules.

Discussion revolved around Prof. Hall's statement that "to receive any particular value of horsepower the current goes up directly as the voltage goes down; if the voltage goes down one-half, the heating effect of the current through the motor is four times as much," those participating taking up the question of the effect of lowering the line voltage on locomotives or machines without other changes in conditions. Fred Auld, Westinghouse Electric & Mfg. Co., Charleston, W. Va., declared many mining men entertained the mistaken belief that if the voltage is lowered a locomotive, for instance, will draw more current from the line. In both cases, if the locomotive is pulling a given load up a uniform grade with the controller full on, the current will be decreased in proportion to the reduction in voltage.

J. H. Edwards, associate editor, *Coal Age*, pointed out that care is necessary in discussing the subject, and cited an instance where contenders on both sides proved their points. One lowered the voltage of a substation supplying several locomotives and a miscellaneous mine load and showed that over a period of time the average current delivered by the station increased. The other hooked an ammeter into a locomotive circuit and proved that this machine pulled less current under a given condition when the voltage was lowered. Mr. Edwards explained that the current supplied by the substation increased because more motors were on the line at once, due to the fact that more time was required to negotiate the grade.

Boost Coal Tar for Roads

As a result of the educational work by the Road Tar Bureau, of Pittsburgh, which was organized a short time ago to foster the use of coal tar in road work in Pennsylvania, a number of business, agricultural and automobile organizations, as well as municipal and county governmental bodies, have joined in the movement.

Bituminous Coal Organizes for Code Operation; Illinois and Indiana Differ on Prices

Despite uncertainties growing out of the delay in selection of presidential appointees to the various code authorities and the lack of definite rulings on a number of other questions, the soft-coal industry made rapid strides in October toward the establishment of an organization for operation under the bituminous code. With the exception of the presidential appointees, divisional and subdivisional code authorities were set up in all divisions; this code personnel is shown on pp. 390-1. Price schedules were approved by the NRA for all districts except western Kentucky and Illinois.

Preliminary plans called for the appointment by the President of one member to the divisional and each of the subdivisional code authorities in Division I, as well as one member to the divisional authorities for Divisions II, III, IV and V, these members to serve also on the subdivisional authorities in their respective divisions. A slate of appointees for these positions was rejected by General Johnson on Oct. 23 on the ground that to avoid attacks in the next Congress these appointees should be neither coal men nor the appointees of coal men. A satisfactory solution of the difficulty had not been reached early in November.

The question of who would pay the salaries and expenses of the deputy administrator for coal and the presidential appointees to the various code authorities and labor and industrial boards brought out a difference of opinion late in October. Following approval by Division I, the Indiana and Illinois subdivisions of District II and Division V of the proposal that these payments should be met by the industry, a reversal of sentiment took place late in the month, representatives of the operators holding that this would be far more open to attack than the sponsorship of appointees. This opinion was shared by a number of other industrial groups, which filed a joint protest with the NRA.

Establishment of district price schedules was featured by a clash between Illinois and Indiana over the question of differentials, complicated by internal differences in both states. The break between the two occurred at a Division II meeting in Chicago early in October, at which Illinois representatives suggested that initial efforts should be directed toward the establishment of differentials. Indiana, however, rejected this principle and submitted a separate schedule to the NRA with a request for a ruling on the correlation question. In this request, Indiana declared that it considered the marketing provisions of the code as designed to maintain the competitive status quo as far as possible, and not for the purpose of disturbing long-established price relations. Pointing out that differentials had been established within the state, and that the complete autonomy of marketing organizations within the division was recognized, the request concluded with the statement that correlation must be considered "upon the broad principle of horizontal increases or decreases on any size applied to all mines in all seams in all districts."

After nearly a month of disagreement over the question of differentials, marked by rejection by the NRA of one price schedule, a second schedule, said to eliminate objectionable delivered price features, was submitted by Illinois on Nov. 2. The controversy between Illinois groups, according to reports, took in practically all districts as well as groups within certain districts. The internal differences in Indiana were reported to have grown out of provisions for the absorption of freight rate differentials in prices and alleged preferential prices in the market territory outside the state.

Apparently as a result of the Illinois-Indiana controversies, the NRA, over the signature of Frank Haas, new technical

Bituminous Divisional and Subdivisional Code Authority Personnel

DIVISION I

C. C. Dickinson, Dickinson Fuel Co. (chairman).
Wm. Emery, Jr., Cambridge Collieries Co. (secretary).
Charles G. Berwind, Berwind-White Coal Mining Co.
Wm. G. Caperton, New River Coal Co.
Heath S. Clark, Rochester & Pittsburgh Coal Co.
Oscar M. Deyerle, Flat Top Fuel Co.
J. D. A. Morrow, Pittsburgh Coal Co.
W. A. Richards, Sovereign Pocahontas Co.
J. Noble Snider, Consolidation Coal Co.
Scott Stewart, W. J. Rainey, Inc.
R. E. Taggart, Stonega Coke & Coal Co.
C. W. Watson, Elk Horn Coal Corporation.

Ohio Subdivision

Wm. Emery, Jr., Cambridge Collieries Co. (chairman).
E. H. Davis, New York Coal Co.
R. L. Ireland, Jr., Hanna Coal Co.
D. P. Loomis, Canton Coal Co.
J. H. Miles, Akron Coal Co.
W. L. Robison, Youghiogheny & Ohio Coal Co.
George K. Smith, Sunday Creek Coal Co.
Whitney Warner, W. H. Warner & Co., Inc.

Western Pennsylvania Subdivision

George S. Baton, Greensburg-Connellsville Coal & Coke Co.
H. F. Bovard, Keystone Coal & Coke Co.
A. R. Budd, Hillman Coal & Coke Co.
B. H. Canon, Fort Pitt Coal & Coke Co.
H. L. Findlay, Youghiogheny & Ohio Coal Co.
F. M. Graff, Westmoreland Mining Co.
J. G. Hoffstot, Lincoln Gas Coal Co.
C. F. Hosford, Jr., Butler Consolidated Coal Co.
R. E. Jamison, Jamison Coal & Coke Co.
W. W. Keefer, Pittsburgh Terminal Coal Corporation.
R. H. Knode, General Coal Co.
George H. Love, Union Collieries Co.
J. D. A. Morrow, Pittsburgh Coal Co.
Clyde E. Speer, Clyde E. Speer Coal Co.
Scott Stewart, W. J. Rainey, Inc.
J. T. M. Stoneroad, Carnegie Coal Corporation.
Fred Stover, Coal Operators' Sales Co.

Eastern Subdivision
(Central Pennsylvania)

Charles O'Neill, Peale, Peacock & Kerr, Inc. (chairman).
Walter A. Jones, Central Pennsylvania Coal Producers' Association (secretary).
J. H. Allport, Rich Hill Coal Co.
L. G. Ball, Heisley Coal Co.
Charles G. Berwind, Berwind-White Coal Mining Co.
M. J. Bracken, Argyle Coal Co.
J. R. Caseley, Buffalo & Susquehanna Coal & Coke Co.
Heath S. Clark, Rochester & Pittsburgh Coal Co.
G. Dawson Coleman, Ebensburg Coal Co.
J. A. Connelly, Jr., Barnes & Tucker.
A. B. Crichton, Johnstown Coal & Coke Co.
John D. Dickson, Shawmut Coal & Coke Co.
R. Richard Eichelberger, E. Eichelberger & Co.
Douglas Gorman, Cumberland Coal Co.
J. F. Graves, Consolidation Coal Co.
A. F. Kempe, Logan Coal Co.
Telford Lewis, Knickerbocker Fuel Co.
W. A. Marshall, W. A. Marshall & Co., Inc.
A. J. Musser, Clearfield Bituminous Coal Corporation.
Charles A. Owen, Imperial Coal Corporation.
R. M. Shepherd, Allegheny River Mining Co.
Arthur B. Stewart, Davis Coal & Coke Co.
J. William Wetter, Madeira, Hill & Co.
R. W. Wigton, Morrisdale Coal Co.
J. W. Searles, Pennsylvania Coal & Coke Corporation (deceased).

Northern West Virginia Subdivision

R. M. Hite, Virginia & Pittsburgh Coal & Coke Co. (president).
David C. Reay (secretary).
S. D. Brady, Jr., Osage Coal Co.
George D. Curtin, Pardee & Curtin Lumber Co.
Edward Page, New England Coal & Coke Co.
J. Noble Snider, Consolidation Coal Co.
A. Lisle White, Virginia-Maryland Coal Corporation.

Southern Subdivision No. 1
(Southern West Virginia and Virginia low-volatile fields)

P. M. Snyder, C.C.B. Smokeless Coal Co. (chairman).
A. A. Liggett, Raleigh Coal & Coke Co. (secretary).
O. L. Alexander, Pocahontas Fuel Co.
H. B. Baird, Berwind-White Coal Mining Co.
Wm. G. Caperton, Jr., New River Coal Co.
W. G. Crichton, Johnstown Coal & Coke Co.
Oscar M. Deyerle, Flat Top Fuel Co.
H. D. Everett, Smokeless Fuel Co.
R. S. McVeigh, Pond Creek Pocahontas Co.
S. S. Nicholls, White Oak Coal Co.
E. C. Page, Crozer Coal & Coke Co.
W. A. Richards, Sovereign Pocahontas Co.
George W. St. Clair, Jewell Ridge Coal Corporation.
John L. Steinbugler, W. C. Atwater & Co., Inc.

Southern Subdivision No. 2
(High-volatile fields of southern West Virginia, Virginia, Kentucky and northern Tennessee)

Irvin Davis, Hatfield-Campbell Creek Coal Co. (chairman).
C. B. Gleaves, Consolidation Coal Co. (secretary).
A. L. Allais, Columbus Mining Co.
N. D. Bachman, Black Mountain Corporation.
Hugh Buford, Ashless Coal Sales Co.
C. A. Cabell, Carbon Fuel Co.
D. B. Cornett, Cornett-Lewis Coal Co.
R. S. Graham, Wise Coal & Coke Co.
J. F. Hunter, Virginia Iron, Coal & Coke Co.
H. A. McAllister, McCall Coal Co.
C. M. Moore, Moore Coal Co.
L. C. Percival, Island Creek Coal Co.
N. B. Perkins, Perkins-Bowling Coal Corporation.
E. R. Price, Inland Steel Co.
R. D. Stockdale, Red Jacket Consolidated Coal & Coke Co.
J. M. Vest, Landstreet-Downey Coal Co.

West Kentucky Subdivision

J. L. Rogers, Rogers Bros. Coal Co. (chairman).
C. F. Richardson, West Kentucky Coal Co. (vice-chairman).
C. E. Reed, West Kentucky Coal Bureau (secretary).
H. H. Coil, Blue Valley Coal Corporation.
K. U. Meguire, Dawson Daylight Coal Co.
B. F. Reed, Pioneer Coal Co.

adviser on coal, advised all code authorities on Oct. 19 that the natural advantages of a producer cannot be arbitrarily taken away by a code authority, and that mines shipping intrastate are subject to the code. The text of Mr. Haas' ruling follows:

Certain of the code authorities have attempted to set prices on the basis that those operators located nearer to the consuming markets, with favorable freight rates, should have this advantage offset by adding to the f.ob. mine price in order that the prices in the consuming market might be approximately the same.

There is nothing in the code which contemplates doing away with competition, and where one producer has a natural advantage this advantage cannot be arbitrarily taken away from him by a code authority. As an example, the Panhandle district of West Virginia might form a sales agency or agencies representing two-thirds of their producers and agree on a price which is lower than some other region which has a more favorable freight rate differential. This would be perfectly permissible as long as the Panhandle producers could demonstrate that their price was a fair price, as comprehended by Art. VI, Secs. 1 and 2. Conversely, the Panhandle district would have no right to expect operators enjoying more favorable freight rates to raise their f.o.b. mine price to a price sufficient to enable the Panhandle operators to make a profitable showing.

On the question of railway fuel prices, NRA officials announced early in October that code prices governed spot sales and that they believed with the President that contracts without wage clauses should be revised to take care of wage increases. This attitude was transmitted to Joseph B. Eastman, Federal Railroad Coordinator, but in spite of conferences between operators, the coordinator, representatives of the eastern carriers and the NRA, no definite policy was evolved. Late in the month, however, the NRA approved Ohio, Pennsylvania and northern West Virginia price schedules fixing railway fuel prices 10c. under other prices, and the Louisville & Nashville Ry. announced that contracts would be revised to give operators two-thirds of the increased labor cost, bringing prices to within 10c. of other code prices.

Following an announcement by the NRA that information on cost, sales realization and employment was desired for November, a conference with representatives of code authorities was held in Washington on Oct. 30 to consider the forms and methods to be employed in its collection. Four forms were prepared by the NRA in October, covering the following: income from sale of coal by sizes; operating cost for individual mines, showing the cost for working and idle days, Sundays and holidays; company selling cost and overhead, subdivided to show constant and tonnage overhead; and labor statistics, including hours and earnings for each class of labor.

NRA Organizes for Future

An organization plan designed to adapt the NRA to meet the problems involved in the administration and enforcement of codes was announced on Oct. 25. The new plan is based on the formation of four divisions for the four major classifications of industry, each division to be headed by an administrator to be responsible for the hearing of proposed and administration of approved codes. The four industrial divisions are: Division I, extractive industries (metals, coals—also automobiles, shipping and related industries); Division II, construction and machinery, including lumber and metal

Bituminous Divisional and Subdivisional Code Authority Personnel

DIVISION II

George W. Reed, Peabody Coal Co. (chairman).
W. R. Krapfel, Empire Fuel Co. (vice-chairman).
C. N. Templeton, Templeton Coal Co. (vice-chairman).
F. S. Martin, Electric Coal Co. (secretary-treasurer).
D. W. Buchanan, Old Ben Coal Corporation.
G. D. Cowin, Bell & Zoller Coal & Mining Co. (alternate).
W. F. Davis, St. Louis & O'Fallon Coal Co.
George A. Enos, Enos Coal Mining Co.
George Heaps, Jr., Rex Fuel Co.
Hubert E. Howard, Binkley Coal Co. (alternate).
W. J. Jenkins, Consolidated Coal Co. of St. Louis (alternate).
John Shirkie, Shirkie Coal Co.
Jonas Waffle, Coal Trade Association of Indiana.
A. L. Wilcoxson, Sangamon Coal Co.
F. H. Woods, Sahara Coal Co.

ILLINOIS SUBDIVISION

D. W. Buchanan, Old Ben Coal Corporation.
G. D. Cowin, Bell & Zoller Coal & Mining Co.
W. F. Davis, St. Louis & O'Fallon Coal Co.
George B. Harrington, Chicago, Wilmington & Franklin Coal Co.
Hubert E. Howard, Binkley Coal Co.
W. J. Jenkins, Consolidated Coal Co. of St. Louis.
F. S. Martin, Electric Coal Co.
T. C. Mullins, Midland Electric Coal Corporation.
George W. Reed, Peabody Coal Co.
A. B. Steffens, Indiana & Illinois Coal Corporation.
C. G. Stiehl, Patterson-Harding Coal Co.
A. L. Wilcoxson, Sangamon Coal Co.
F. H. Woods, Sahara Coal Co.
Harold D. Wright, Republic Coal & Coke Co.

INDIANA SUBDIVISION

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Wm. Bootz, Crescent Coal Co.
C. G. Hall, Walter Bledsoe & Co.
David Ingle, Ingle Coal Co.
George J. Leahy, Binkley Mining Co.
H. B. Lee, Maumee Collieries Co.
M. J. McGarr, Jackson Hill Coal & Coke Co.
J. T. Moorman, Patoka Coal Co.
Earl Oliphant, Standard Coal Co.
R. H. Sherwood, Central Indiana Coal Co.
John Shirkie, Shirkie Coal Co.
H. P. Smith, Ebbw Vale Coal Co.
M. M. Soule, Electric Coal Co.
C. N. Templeton, Templeton Coal Co.
W. M. Zeller, Jr., Knox Consolidated Coal Co.

IOWA SUBDIVISION

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S. V. Carpenter, Sunshine Coal Co.
George Heaps, Jr., Rex Fuel Co.
W. D. Johnson, Boone Coal Co.
T. A. King.
W. M. Krapfel, Empire Fuel Co.
L. P. Love, Pershing Coal Co.
M. B. McConville, McConville Coal Co.
Joseph Muelhaupt, Des Moines Ice & Fuel Co.
H. M. Poole, Norwood-White Coal Co.
John Ramsay, Economy Coal Co.
Jake Ritter, Old King Coal Co.
E. A. Sayre.
M. G. Youngquist, Empire Fuel Co.

DIVISION III

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N. E. Cross (secretary).
A. B. Aldridge, Stith Coal Co.
C. S. Bissell, Benoit Coal Mining Co.
H. M. Brooks, Alabama Fuel & Iron Co.
H. T. DeBardeleben, DeBardeleben Coal Corporation.
L. E. Geohegan, Gulf States Steel Co.
E. L. Hampton, Tennessee Consolidated Coal Co.
P. H. Haskell, Hammond Iron Co.
A. R. Long, Brookside-Pratt Mining Co.
Hugh Morrow, Sloss-Sheffield Steel & Iron Co.
John E. Patton, Sewanee Fuel & Iron Co.
George F. Peter, Southern Coal & Coke Co.
H. J. Weeks, Durham Land Co.
(No subdivisional code authorities established in Division III.)

DIVISION IV

Grant Stauffer, Sinclair Coal Co. (chairman).
Frank Barrow, Coal Creek Coal Co.
A. D. Clark, Covington Coal Co.
C. H. Hubbell.
Francis Keegan, Western Coal & Mining Co.
L. Russell Kelce, Hume-Sinclair Coal Mining Co.
L. D. Kniffin, Sheridan Coal Co.
J. F. Lake, Charleston Coal Co.
A. E. Marriott, Marriott Coal Co.
J. A. Meyers, Apex Coal Co.
W. P. Mullen, Mullen Coal Co.
J. C. Reid.
W. C. Shank, Crowe Coal Co.
Guy Shrigley, Diamond Anthracite Coal Co.
K. A. Spencer, Pittsburg & Midway Coal Mining Co.
R. W. Winn, Mack Coal Co.

KANSAS-MISSOURI-OKLAHOMA SUBDIVISION

Grant Stauffer, Sinclair Coal Co.
Frank Barrow, Coal Creek Coal Co.
C. H. Hubbell.
Francis Keegan, Western Coal & Mining Co.
L. Russell Kelce, Hume-Sinclair Coal Mining Co.
L. D. Kniffin, Sheridan Coal Co.
A. E. Marriott, Marriott Coal Co.
J. A. Meyers, Apex Coal Co.
W. P. Mullen, Mullen Coal Co.
J. C. Reid.
W. C. Shank, Crowe Coal Co.
K. A. Spencer, Pittsburg & Midway Coal Mining Co.

ARKANSAS-OKLAHOMA SUBDIVISION

(Arkansas and LeFlore, Haskell and Sequoyah Counties, Oklahoma)
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B. H. Bedwell, E. D. Bedwell Co. (secretary).
Robert Boyd.
A. D. Clark, Covington Coal Co.
Earl Cobb, San Bois Coal Co.
J. F. Lake, Charleston Coal Co.
J. G. Puterbaugh, McAlester Fuel Co.
Guy Shrigley, Diamond Anthracite Coal Co.

DIVISION V

F. V. H. Collins, Bair-Collins Co. (chairman).
John R. Doolin, Utah Coal Producers' Association (secretary).
K. H. Aber, Gallup American Coal Co.
H. B. Crandell, Clayton Coal Co.
L. T. Dee, Lion Coal Corporation.
Moroni Heiner, Utah Fuel Co.
E. M. Hendricks.
Stanley B. Houck.
J. E. Lee, Sheridan-Wyoming Coal Co.
H. C. Marchant, Pinnacle-Kemmerer Coal Co.
J. B. Marks, Independent Coal & Coke Co.
V. R. McKnight, Defiance Coal Co.
N. D. Moore, Pacific Coast Coal Co.
A. G. Nelson.
T. J. O'Brien, Kemmerer Fuel Co.
Thomas Russell, Coal Dept., Anaconda Copper Mining Co.
D. R. Swem, Northwestern Improvement Co.
R. J. Warriner, Owl Creek Coal Co.
Arthur S. White, National Fuel Co.

NORTHERN COLORADO SUBDIVISION

James Brennan, Imperial Coal Co.
H. B. Crandell, Clayton Coal Co.
Harry F. Nash, Leyden Lignite Co.
P. M. Peltier, Boulder Valley Coal Co.
Josephine Roche, Rocky Mountain Fuel Co.
F. W. Thurman.
W. D. Wade, Pikes Peak Fuel Co.
Arthur S. White, National Fuel Co.

SOUTHERN COLORADO-NEW MEXICO SUBDIVISION

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G. C. Davis, Phelps Dodge Corporation.
H. C. Marchant, Pinnacle-Kemmerer Coal Co.
A. G. Nelson.
John P. Thomas, Canon District Coal Co.
L. C. White, Swastika Fuel Co.
F. R. Wood, Temple Fuel Co.

The Late J. W. Searles

products; Division III, chemicals, leather and other manufactures; Division IV, trades and service, textiles and clothing.

Division I is headed by K. M. Simpson, with W. H. Davis, Philip C. Kemp, K. J. Ammerman and L. H. Peebles as deputy administrators. Malcolm Muir, president, McGraw-Hill Publishing Co., is administrator for Division II; Gen. C. C. Williams, for Division III, and Arthur D. Whiteside, for Division IV. Each division will be a unit in itself, with legal advisers, technical experts and industrial, labor and consumers' advisers permanently assigned to it.

The reorganization plan also calls for the formation of an NRA Compliance Division and a National Compliance Board, both to be headed by one man. The division, which will consist of four branches—administrative, trade practice, labor and Blue Eagle—will organize a regional compliance system, pending the completion of which district managers of the Department of Commerce have been appointed District Compliance Directors. Regulations provide that all complaints of violations of permanent codes shall be filed at the compliance office in the district in which the violation is committed. Reference of complaints to code authorities is provided for only upon the specific authorization of the National Compliance Director. Complaints of violations of the PRA will continue to be submitted to local NRA Compliance Boards.

The National Compliance Board, in addition to the National Compliance Director, will consist of one member each of the NRA Industrial and Labor Advisory Boards. Upon receiving complaints from the director, this board will undertake further attempts at adjustment and also will recommend exceptions from code provisions, order the withdrawal of the Blue Eagle from violators or refer violations to either the Federal Trade Commission or the Attorney General for appropriate action.

Another outgrowth of the reorganization is the NRA Trade Association Division, designed to prepare plans for and advise industry in organization for self-government.

Personal Notes

JOHN UNSINN, superintendent, Mahanoy City (Pa.) colliery of the Philadelphia & Reading Coal & Iron Co., was appointed safety inspector for the Mahanoy City division last month.

L. C. GUNTER, Knoxville, Tenn., has been elected secretary of the Southern Appalachian Coal Operators' Association, vice R. E. Howe, now secretary of Appalachian Coals, Inc.

J. B. HASKELL, superintendent, frog and switch department, West Virginia Rail Co., Huntington, W. Va., has been elected president of the Huntington Chapter, American Association of Engineers.

EDWARD B. WINNING has been appointed manager of the northern mines of the Republic Steel Corporation, with headquarters at Connellsville, Pa., vice GEORGE H. MORSE, who becomes vice-president and general manager of the Union Collieries Co., Renton, Pa.

A. F. MARSHALL, formerly division superintendent of mining for the Consolidation Coal Co., Coalwood, W. Va., has been appointed safety engineer and labor commissioner for the Pocahontas Operators' Association, with headquarters at Bluefield, W. Va.

HERBERT C. RYDING, president of the Tennessee Coal, Iron & R. R. Co., Birmingham, Ala., for the past three years and an executive of the company for 25 years, retired from office on Oct. 15. He is succeeded by ROBERT GREGG, vice-president in charge of sales and general manager, whose duties are taken over by M. H. GEISKING.

J. P. WILLIAMS, JR., Pittsburgh, Pa., president of the Koppers Coal Co. and the Koppers Coal & Transportation Co., has been elected vice-president of the Koppers Co. H. B. RUST, formerly president of the Koppers Co., has been elected chairman of the board, and is succeeded by J. T. TIERNEY.

OLIVER J. GRIMES, managing director, Committee of Ten—Coal and Heating Industries, and prior to that time secretary of the Utah Coal Producers' Association, was appointed executive assistant to Secretary of War Dern in November. Mr. Grimes will continue to act in an advisory capacity to the Committee of Ten and will carry on the work of promoting Bituminous Coal Research, Inc.

PERCY C. MADEIRA, founder of Madeira, Hill & Co. and its executive head for 40 years, was elected chairman of the board last month. He is succeeded as president by JOHN GILBERT, who started with the company as secretary in 1918 and later was elected vice-president and treasurer.

Industrial Notes

W. K. LEACH, formerly with the General Alloys Co., Boston, Mass., has joined the staff of the American Manganese Steel Co. as general manager of the alloy division, with headquarters at St. Louis, Mo.

AMERICAN ROLLING MILL CO., Middletown, Ohio, has announced that it will manufacture and distribute Armco 17 and Armco 18-8 stainless steel sheets, strips and plates. To handle sales the company has created a "stainless steel sales department," with J. P. BUTTERFIELD, formerly manager of the development department, in charge. He will be assisted by E. E. JONES. Sales will be handled through the district offices, and jobbers are being appointed in several cities.

© Harris & Ewing

Frank Haas

Consulting mining engineer, Philadelphia, Pa., was appointed Technical Adviser on Coal for the National Recovery Administration last month. Mr. Haas, whose connection with the coal industry includes 27 years with the Consolidation Coal Co. and six years of independent practice, succeeds James H. Pierce, president, James H. Pierce & Co., Scranton, Pa., who resigned as full-time adviser early in October.

Obituary

J. W. SEARLES, president, Pennsylvania Coal & Coke Corporation and its subsidiaries since 1923, died at the Homeopathic Hospital, East Orange, N. J., Oct. 15, of thrombosis. Mr. Searles, who was born in Venango City, Pa., in 1870, entered the employ of the Webster Coal & Coke Co., then predecessor and now subsidiary of the Pennsylvania Coal & Coke Corporation, in 1901 as assistant to the sales manager. He became general sales agent for the new corporation in 1911 and vice-president in 1921. During the World War, Mr. Searles was deputy commissioner of the Tidewater Coal Exchange, in charge of coal distribution in the New York metropolitan district.

JOHN WESLEY P. SOMERVILLE, 50, president of the Moscow Georges Creek Mining Co. and other operating companies in Maryland and Pennsylvania, died at Cumberland, Md., Oct. 9.

Coming Meetings

American Mining Congress; annual convention, Dec. 13, 14 and 15, Washington, D. C.

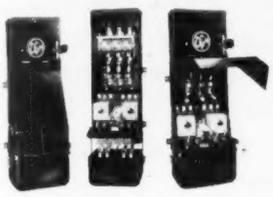
Coal Mining Institute of America; annual meeting, Dec. 6 and 7, Fort Pitt Hotel, Pittsburgh, Pa.

West Virginia Coal Mining Institute; annual meeting, Dec. 5 and 6, West Virginia Hotel, Bluefield, W. Va.

WHAT'S NEW
IN COAL-MINING EQUIPMENT

Magnetic Starter

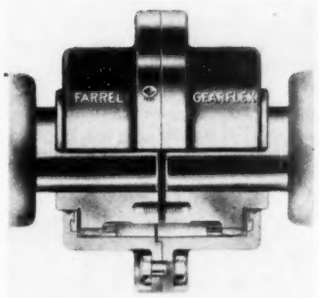
For motors up to 15 hp., 220 volts, and 30 hp., 440-550 volts, Electric Controller & Mfg. Co., Cleveland, Ohio, offers the No. 1 Type ZOS oil-immersed, across-the-line compound magnetic starter containing an unfused or fusible magnetic safety switch, a magnetic starter with overload relays, and heavy-duty test jacks where it is desired to insert meters in the motor circuit without interrupting the operation of the machine. All internal wiring is complete.



While designed for severe service, these starters, according to the company, are exceptionally small and narrow and are equipped with a front-operated safety switch and vertical-opening cover, which facilitates installation where space is limited.

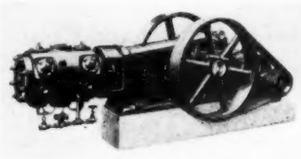
Flexible Coupling

Farrel-Birmingham Co., Inc., Buffalo, N. Y., offers a new flexible coupling of the gear type, known as the Farrel "Gear-Flex" coupling. The double-engagement type illustrated consists essentially of two externally geared hubs keyed to the shafts to be connected to and engaging an internally geared floating sleeve which incases the two hubs. With two sets of spur gears, one at each end of the floating sleeve, misalignment is compensated for by the sleeve assuming a neutral position between the two shafts. Thus, according to the company, all whip and crank action is eliminated, relieving bearings and shafts of heavy pressures or vibration. Other features include: accurately generated external and internal spur gears (Sykes machine) for precision and wide load distribution; centrifugal oiling from a large reservoir between the hubs and the floating sleeve. This coupling also is made in the single-engagement type, which has only one externally geared hub in engagement with an internal gear in the sleeve, the other hub being solid with the sleeve bolted to it. It is designed as a lower-cost coupling for use where the high speed capacity and flexibility of the double-engagement type is not necessary. Both types are available in a number of sizes and power ratings.



Compressors

A new type of two-cylinder two-stage air compressor which requires no cooling water and therefore is applicable where water is scarce, costly or objectionable, is offered by the Ingersoll-Rand Co., New York City. The new machine is called the "Motorcompressor" and is equipped with a built-in motor. Cylinders and intercooler are air-cooled. Units are built in sizes from 20 to 50 hp., with piston displacements of 113 to 310 cu.ft. per minute and discharge pressures up to 125 lb. per sq.in. gage. Over-all efficiency, says the company, is equal to or better than the conventional water-cooled compressors of corresponding capacities.

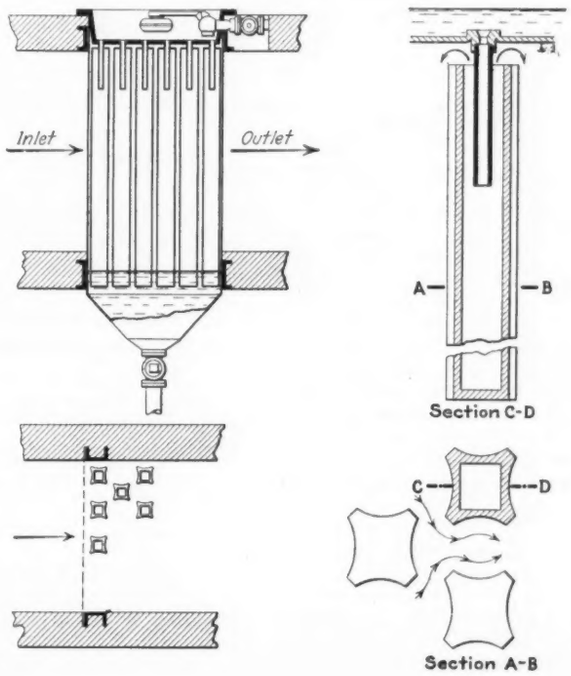


Ingersoll-Rand also offers the new single-stage belt-driven Class ES compressor for heavy-duty service. It has one horizontal double-acting cylinder and operates at moderate speeds. Sizes range from 10 to 125 hp. and discharge pressures from 5 to 150 lb. The machine is suitable, it is said, wherever full-load continuous service is required and power cost is an important consideration. This includes standby service for large compressors whose capacity is not always needed, isolated plant service where there is little supervision, all applications where oil in the discharge line is objectionable or where future changes may require a change in cylinder size. Poisonous or inflammable gases or any others that must not be allowed to leak can be handled satisfactorily, the company says.

Dust Arrester

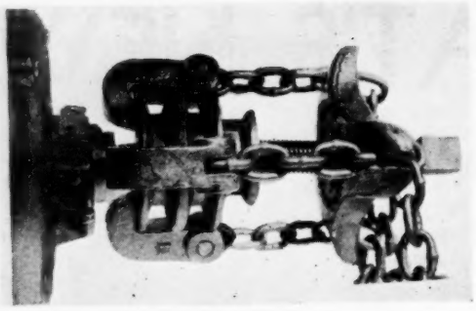
C. Q. Campbell, 220 Bigham St., Pittsburgh, Pa., has been appointed American sales and manufacturing agent for the Hanrez Modave dust arrester for removing fine dust from gases, particularly stack gases. This arrester, it is said, has no moving parts, the gases to be cleaned being brought in contact with a continuously changing stream of water flowing over the entire surface of the vertical, concave-surfaced elements. The water is led into the elements from an overhead tank, where a constant level is supplied by means of a float valve. It then overflows the upper edges of the elements and runs down the sides in an unbroken stream. Gases enter the arrester at right angles to the main axes of the elements and flow through in a swirling manner, bringing the dust particles in contact with the film of water, which carries them down into a bottom tank. The dust-laden water is drawn off through a regulating valve, and can then be wasted or clarified and reused as desired. An efficiency of 95 per cent is claimed for most installations, and the arrester also is adaptable to removal of sulphur fumes with high efficiency. Water consumption is said to be small, even where clarification and reclamation is not practiced.

Left, Section of the Hanrez Modave Dust Arrester; Right, Section of an Element



Gear and Wheel Puller

Armstrong-Bray Co., Chicago, announces a new puller for wheels, pulleys, gears, bushings and pinions, which it designates as the "Steelgrip" uni-



versal gear and wheel puller. The chief advantage cited by the company is the wide—almost universal—range of work it will handle. Consisting of a heavy bracket with large pulling screw and three chains of the desired length, it will handle work at any distance from the end of the shaft, it is said. Chains are double-ended, with standard chain hooks for attaching them to spoked wheels or large gears on one end, as well as special hooks for bushings, small gears, motor pulleys and close work. Two sizes are available with capacities of 12,000 and 36,000 lb.

. . *Transmission Belt*

A new transmission belt, said to feature an endless-wound whipcord construction that has no inelastic stretch, is offered by the Manhattan Rubber Mfg. Division, Raybestos-Manhattan, Inc., Passaic, N. J. This belt, according to the company, is of the continuous-endless-wound type, and its single-layer cord section is the equivalent of six duck plies in strength and much more flexible. It is adapted to high-speed, high-tension drives requiring an endless belt.

Lubricants

A new series of industrial lubricants with unusually high film strength has been announced by E. F. Houghton & Co., Philadelphia, Pa. The increased film strength—said to be 40 to 65 per cent—results from the polymerization of a pure mineral oil under carefully controlled heat and pressure. These lubricants, bearing the name "Sta-Put," cling to the bearings and do not drip or spatter as easily as ordinary mineral oils, according to the company. Three series and grades for nearly every type of industrial equipment are offered, as follows: 300 series, ranging in consistency from light machine oils for high-speed spindles to heavy oils for slow-moving bearings and extremely high loads; 400 series consists of several grades for nearly all types of gears; 500 series, grease-consistency lubricants for screw-down grease cups, automatic grease-lubricating systems, etc.

Rivet-Bolts

Dardelet Threadlock Corporation, 120 Broadway, New York City, offers the "Rivet-Bolt" for structural fastening which has hitherto called for rivets or fitted bolts. Made of high-tensile steel and installed with a hand hammer and wrench, it produces a stronger, stiffer, cheaper joint, the company claims. One use is for joints where it is difficult to head a field rivet. "Rivet-Bolt" head dimensions are A.B.A. standard. The neck is ribbed for the length of the grip. Outside diameter is slightly larger than the standard holes, while the root diameter is slightly less than the threaded section, which is the nominal diameter of the bolt. When the "Rivet-Bolt" is driven home, the ribs deform, setting up a body-bound fit. If the holes are offset, the depth of the ribs allows them to upset and fill the holes in each plate, thus assuring full bearing. The

Dardelet thread locks the "Rivet-Bolt" firmly against vibration and shock, according to the company, thus assuring a permanently tight joint. Special types are available for special requirements.

New V-Belts

A new and improved type of Goodyear "Emerald Cord" V-belt is announced by the Worthington Pump & Machinery Corporation, Harrison, N. J., for use on the Worthington Multi-V-Drive. Higher capacity, longer flexible life, uniform cross-section and low stretch are stressed by the company, which points out that a basic feature is greater concentration of the load-carrying capacity about the neutral axis of the belt.

Oil Circuit Breakers

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., offers two new oil circuit breakers with the statement that they use for the first time condenser bushings on small breakers. These breakers are designated Types F-50 and F-100 and are manually or electrically operated. They are rated for indoor service at 5,000, 7,500 and 15,000 volts, and are said to be especially suited for application where minimum space for switching equipment is available.

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